PATENT & TRADEMARK OFFICE
MAR 11 2004
OIPE

FIG. 1

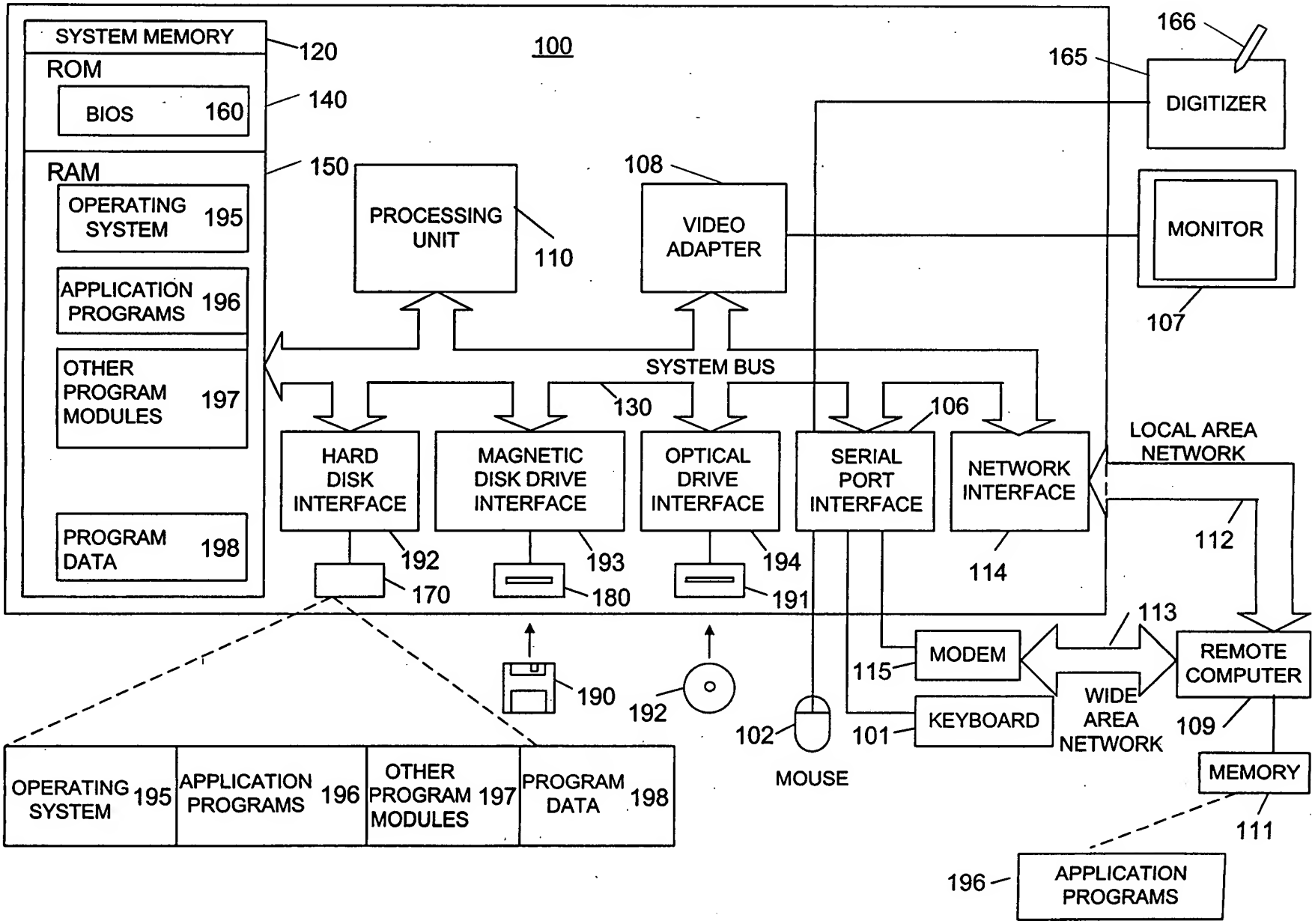
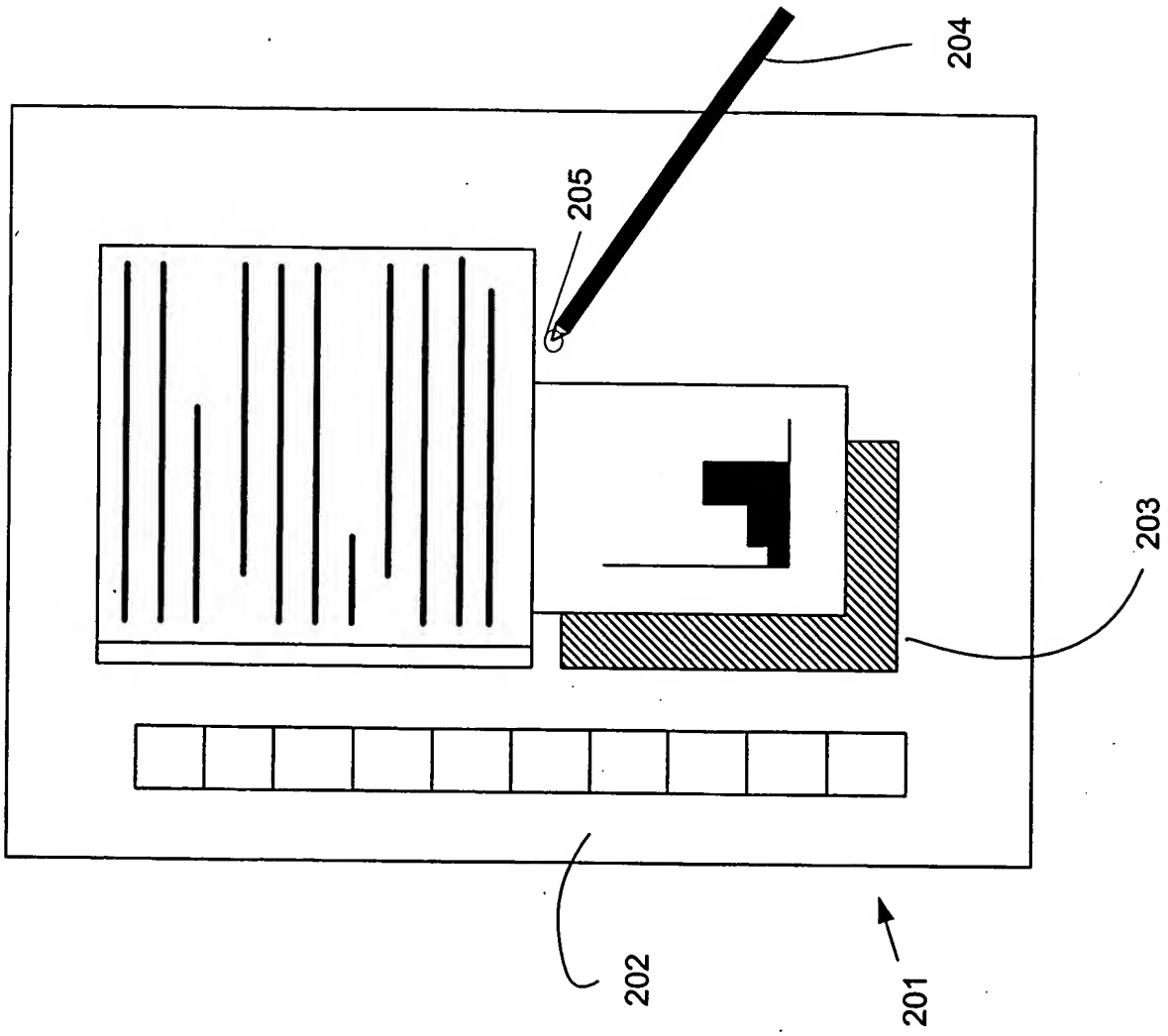


FIG. 2



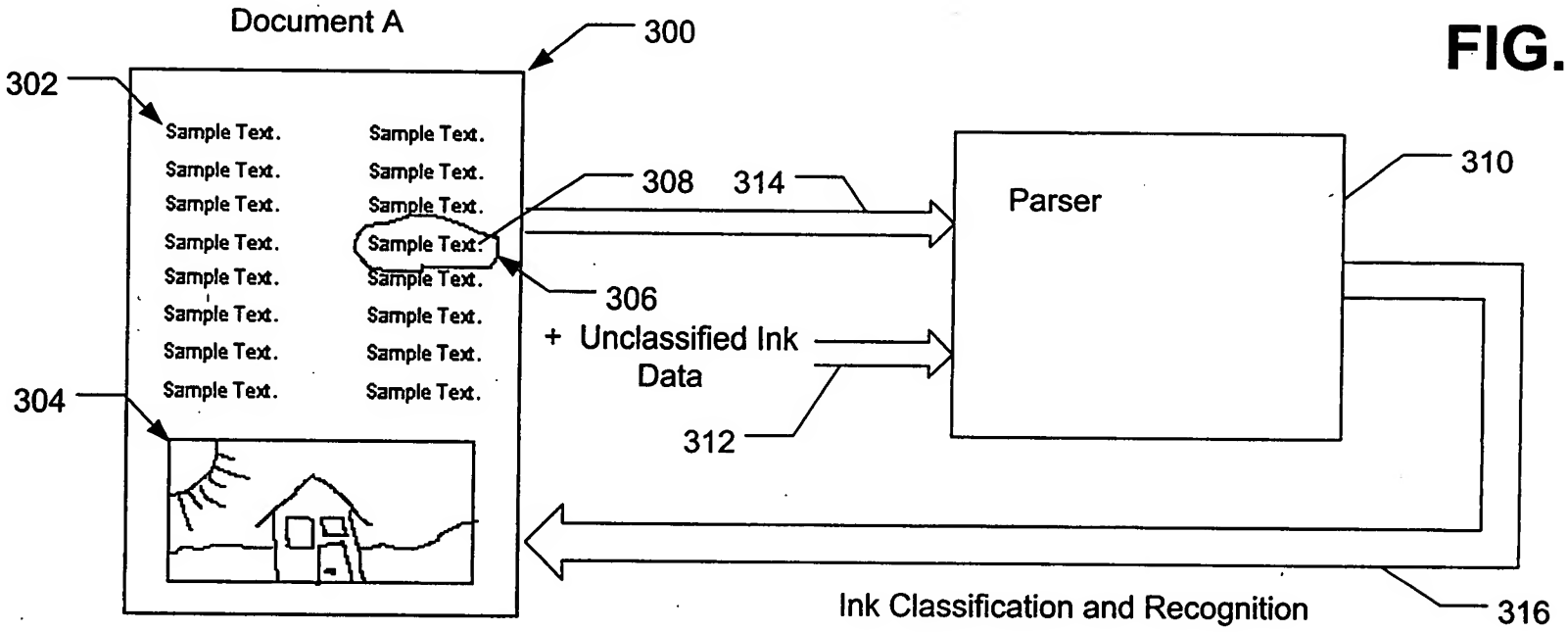

Document A
300
302
Sample Text.
304
308
314
306
+ Unclassified Ink Data
312
Parser
310
Ink Classification and Recognition
316

FIG. 3

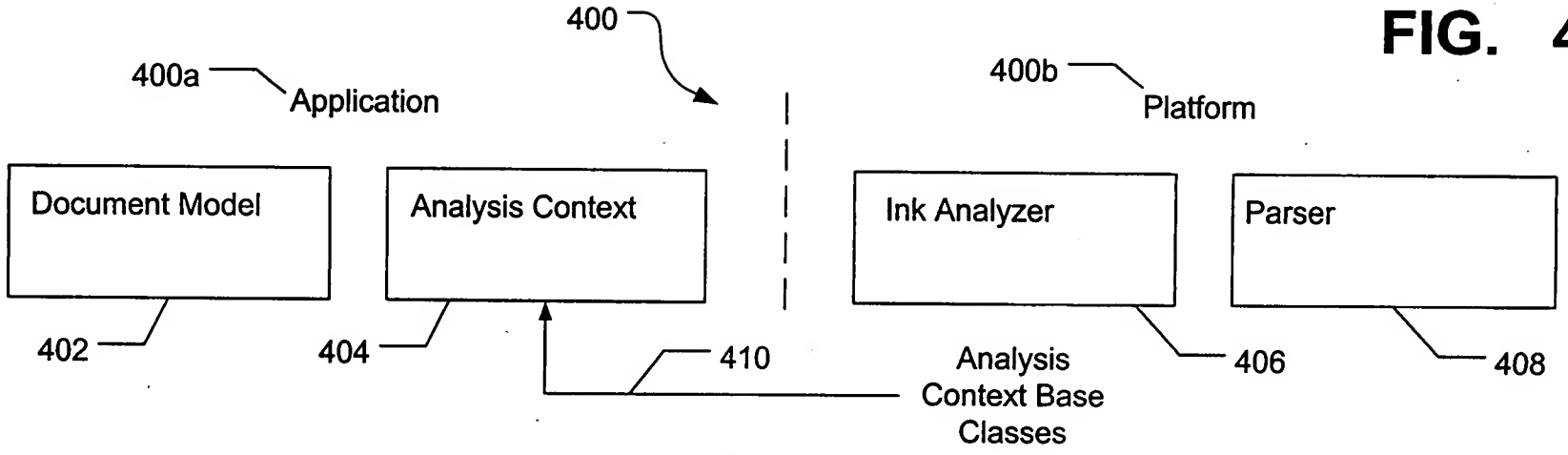
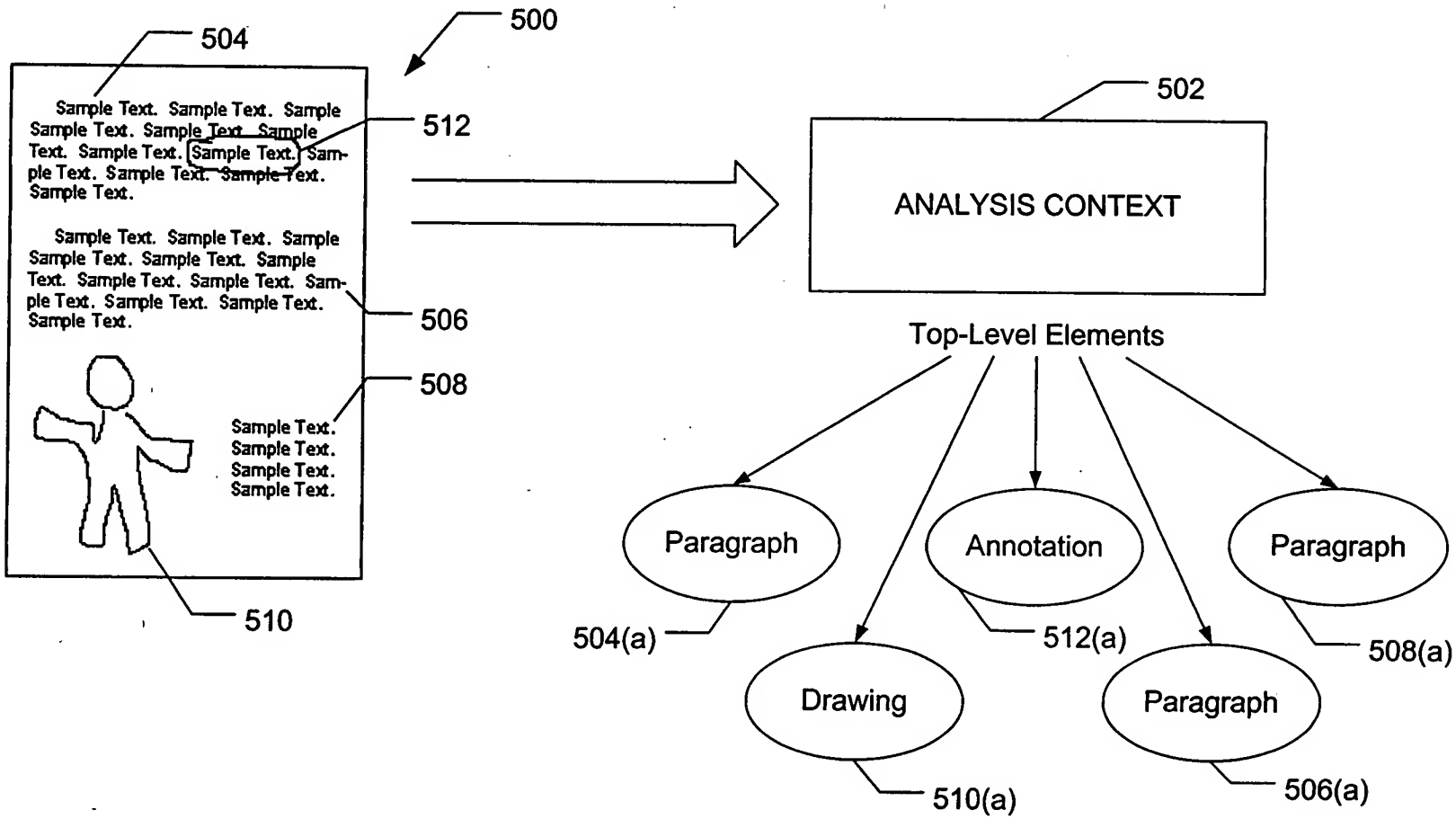

400
400a
Application
400b
Platform
Document Model
Analysis Context
Ink Analyzer
Parser
402
404
410
406
408
Analysis Context Base Classes

FIG. 4

FIG. 5


500
504
Sample Text. Sample Text. Sample Sample Text. Sample Text. Sample Text. Sample Text. Sample Text. Sample Text. Sample Text. Sample Text. Sample Text. Sample Text.
512
Sample Text. Sample Text. Sample Sample Text. Sample Text. Sample Text. Sample Text. Sample Text. Sample Text. Sample Text. Sample Text. Sample Text.
506
508
Sample Text. Sample Text. Sample Text. Sample Text.
510
502
ANALYSIS CONTEXT
Top-Level Elements
Paragraph
504(a)
Annotation
512(a)
Paragraph
508(a)
Drawing
510(a)
Paragraph
506(a)

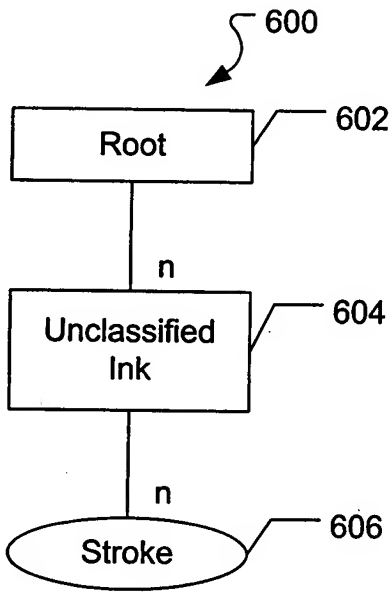


FIG. 6A

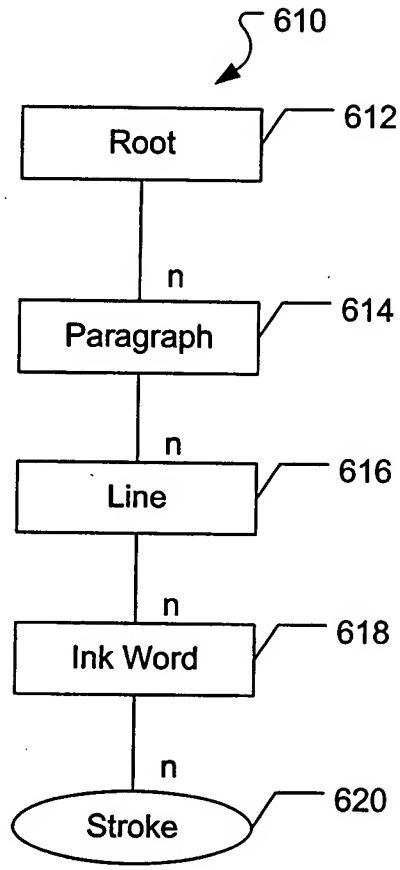


FIG. 6B

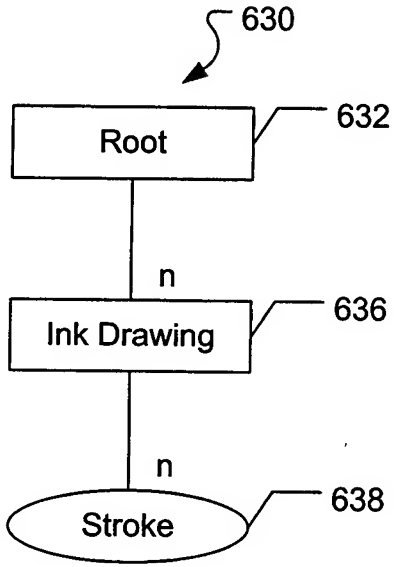


FIG. 6C

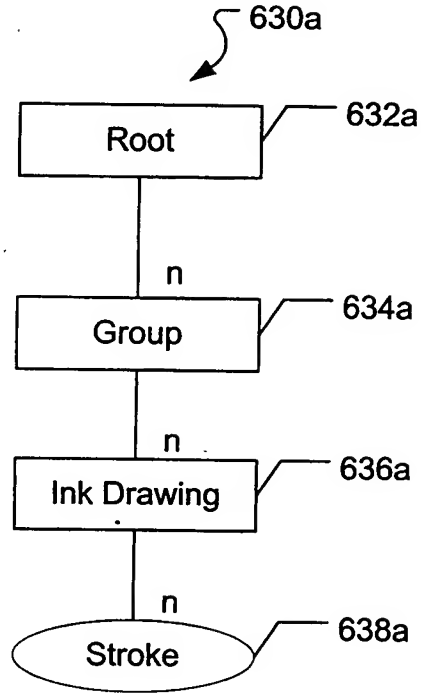


FIG. 6D

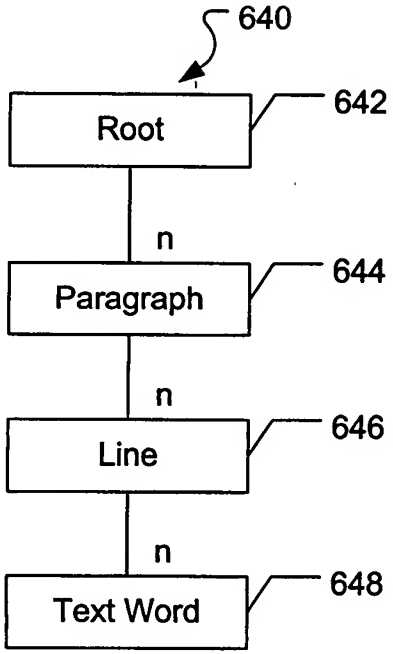


FIG. 6E

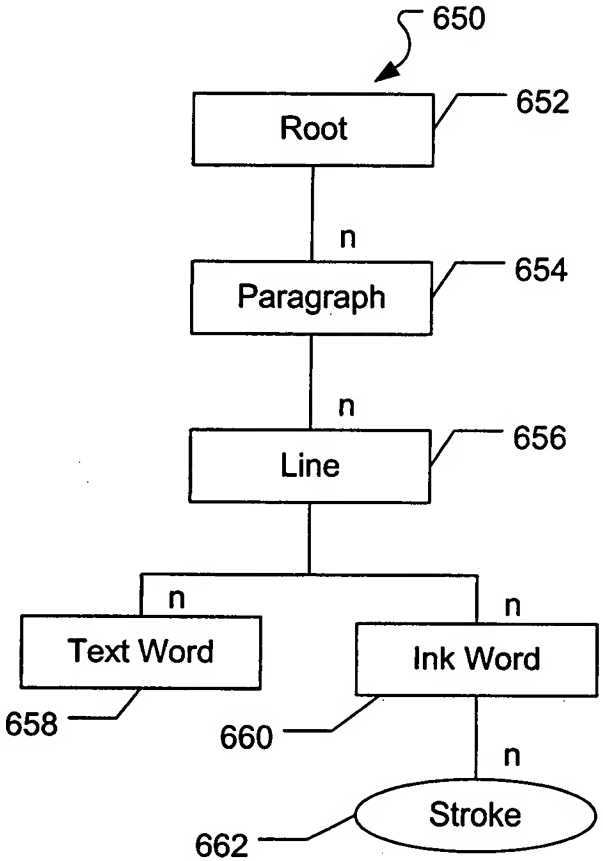


FIG. 6F

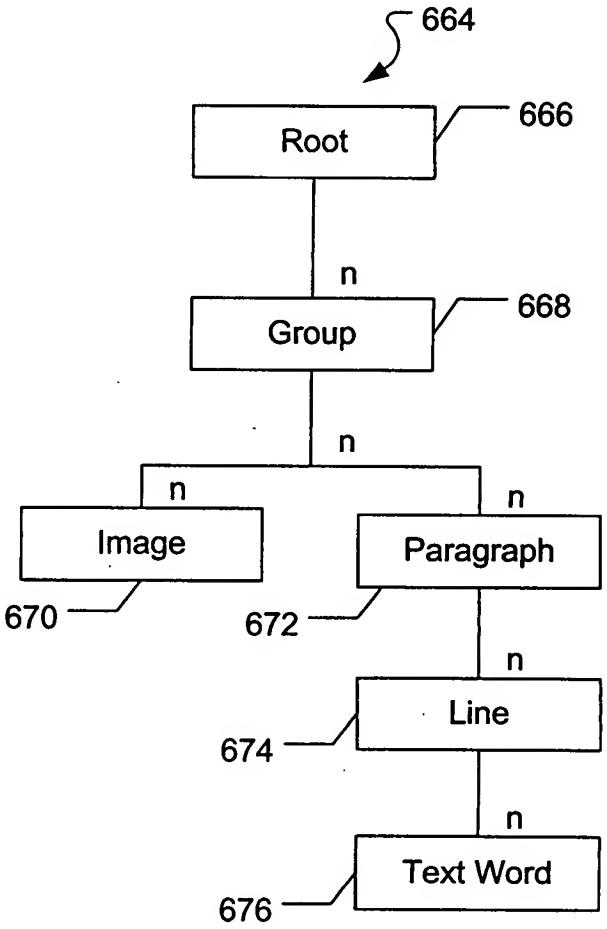


FIG. 6G

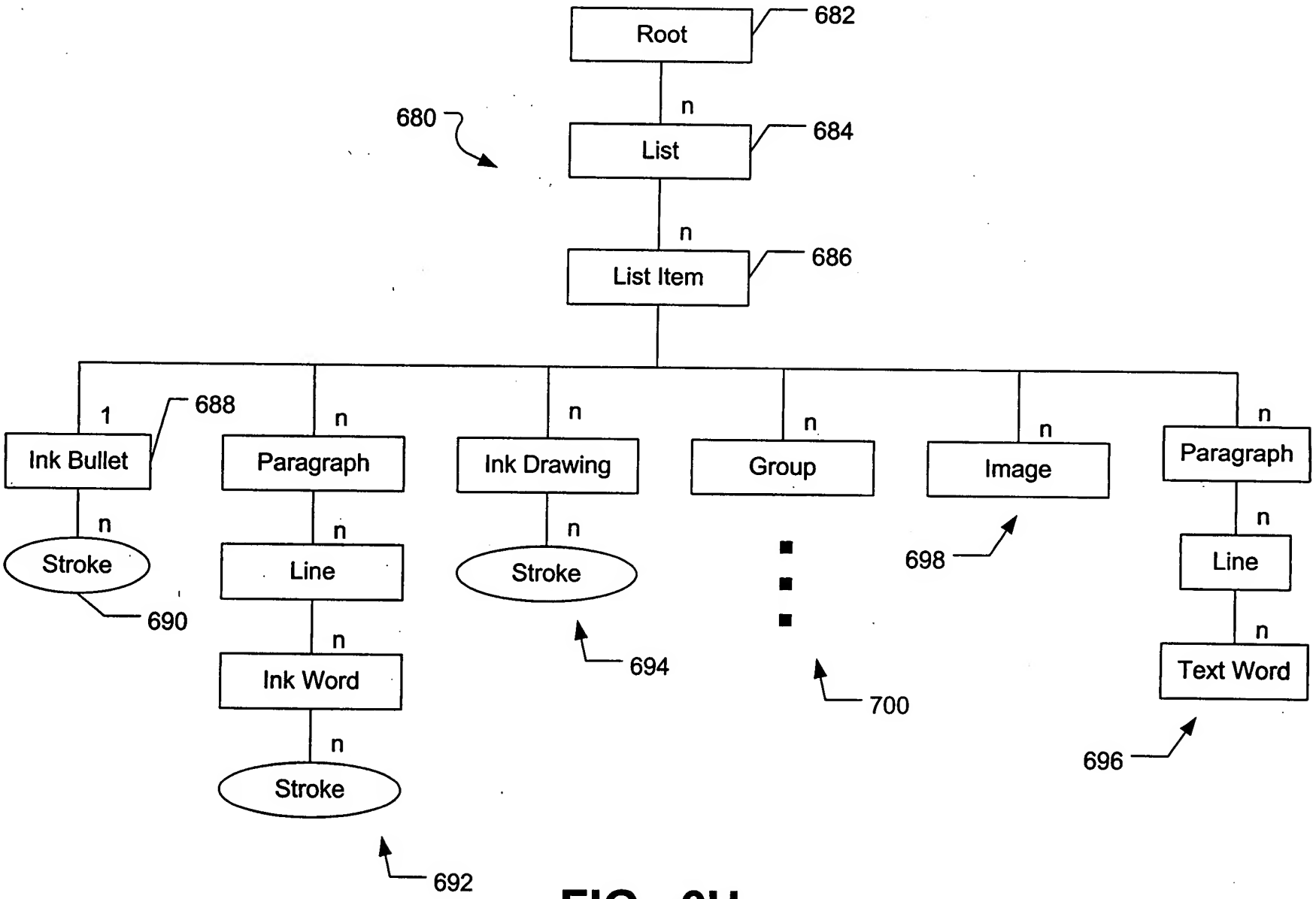

Root
682
n
680
List
684
n
List Item
686
1
688
n
n
n
n
n
Ink Bullet
Paragraph
Ink Drawing
Group
Image
Paragraph
n
n
n
n
Stroke
Line
Stroke
698
Line
690
n
n
694
n
Ink Word
700
Text Word
696
n
Stroke
692

FIG. 6H

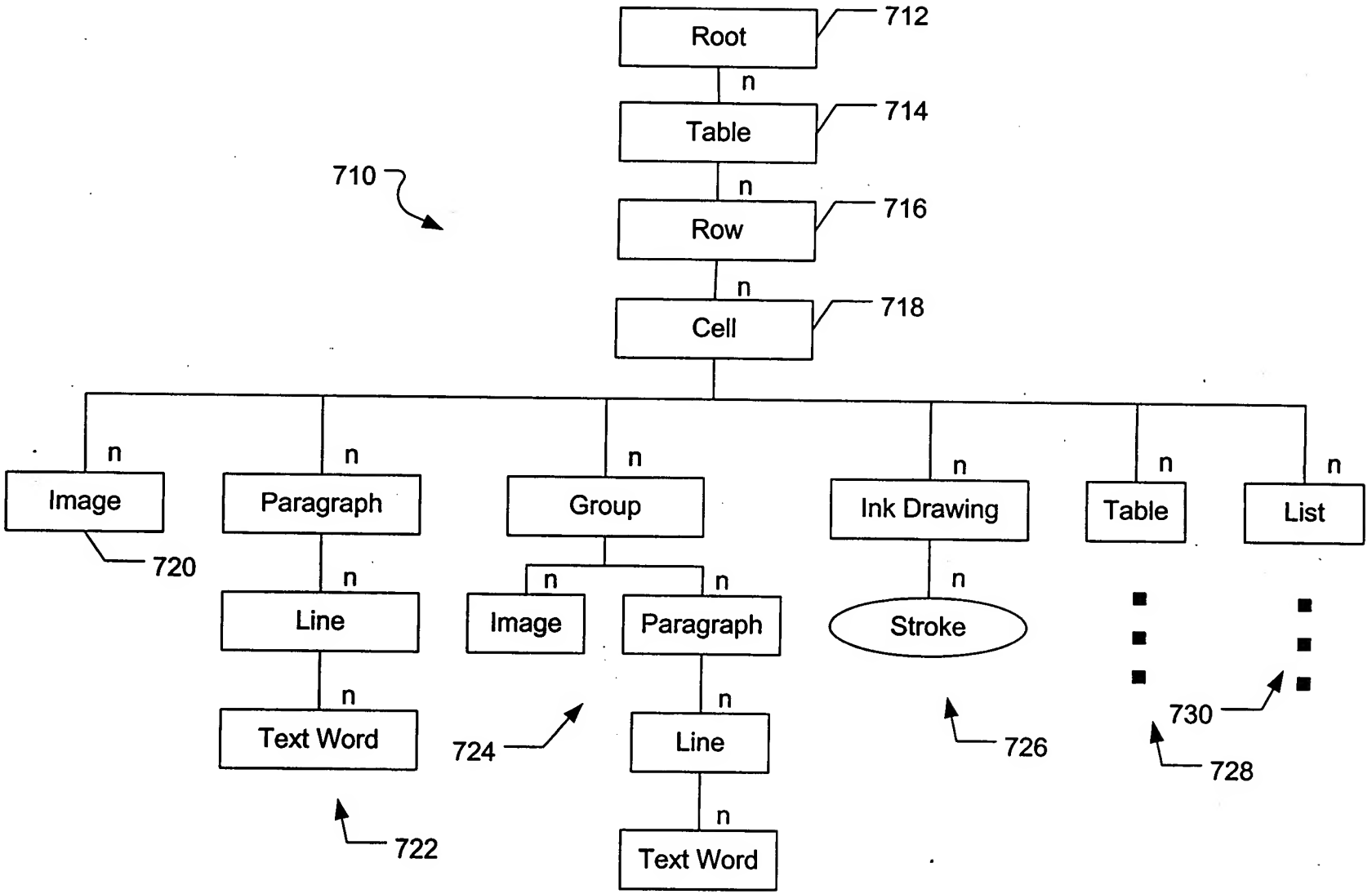

710
Root
712
n
Table
714
n
Row
716
n
Cell
718
n
Image
720
n
Paragraph
n
Line
n
Text Word
722
n
Group
n
Image
n
Paragraph
724
n
Line
n
Text Word
n
Ink Drawing
n
Stroke
726
n
Table
n
List
730
728

FIG. 6I

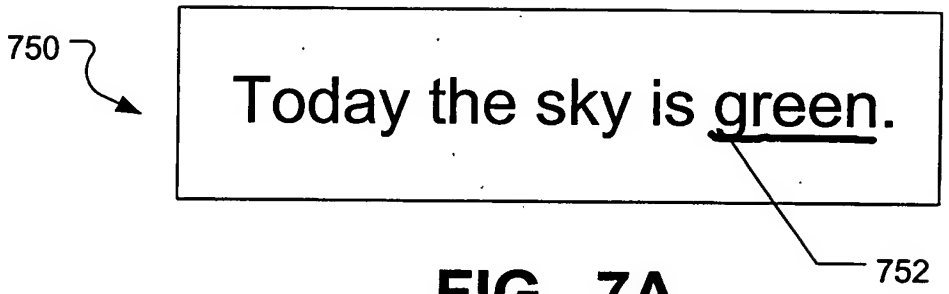

750
Today the sky is green.
752

FIG. 7A

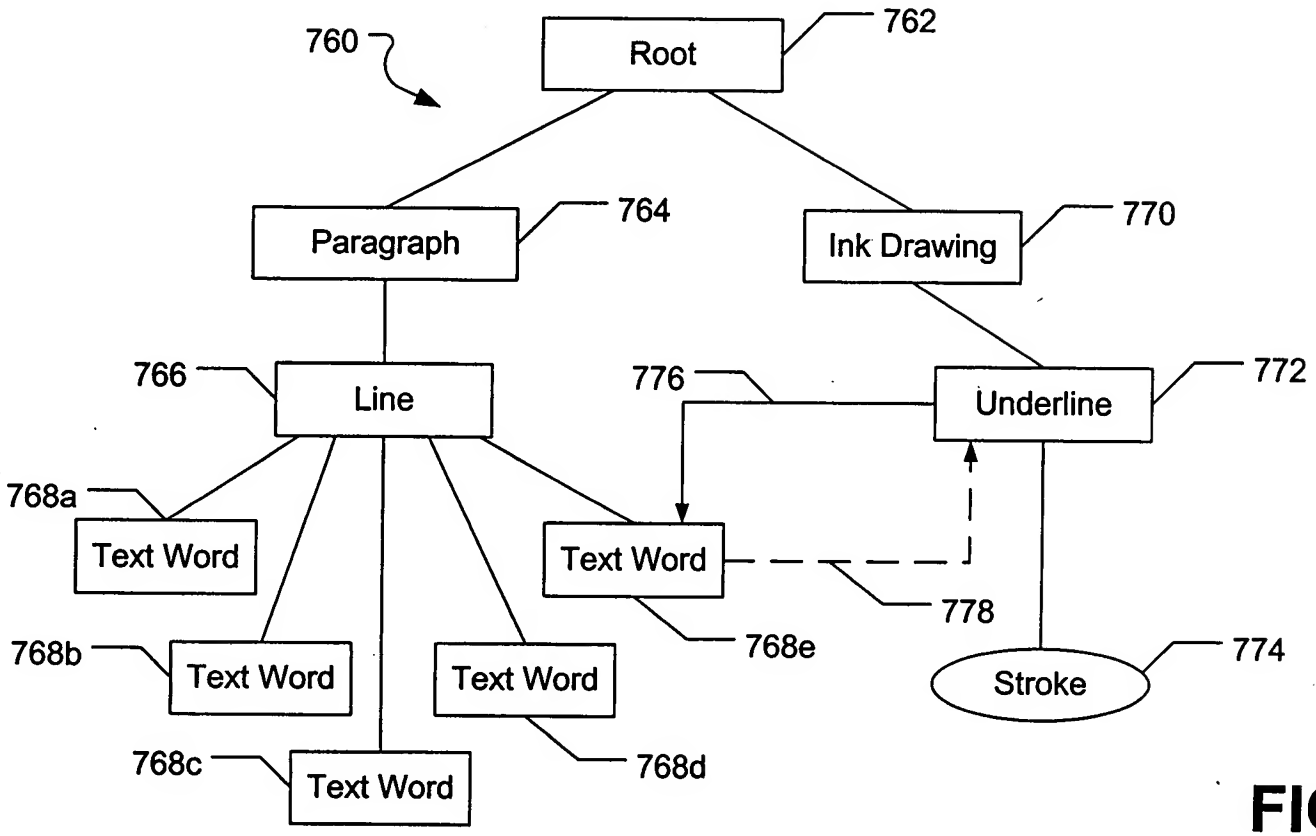

760
Root
762
Paragraph
764
Ink Drawing
770
766
Line
776
Underline
772
768a
Text Word
Text Word
778
768e
768b
Text Word
Text Word
Stroke
774
768c
Text Word
768d

FIG. 7B

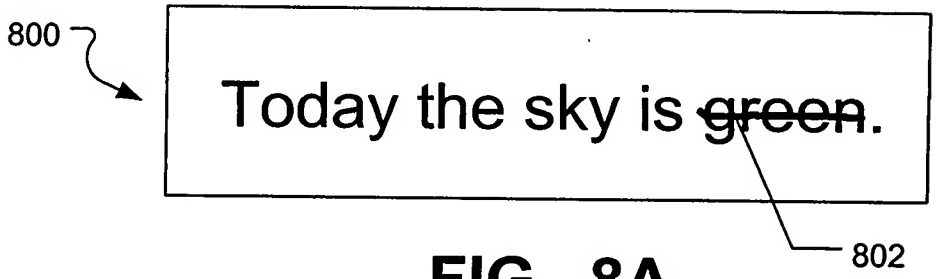

800
Today the sky is ~~green~~.
802

FIG. 8A

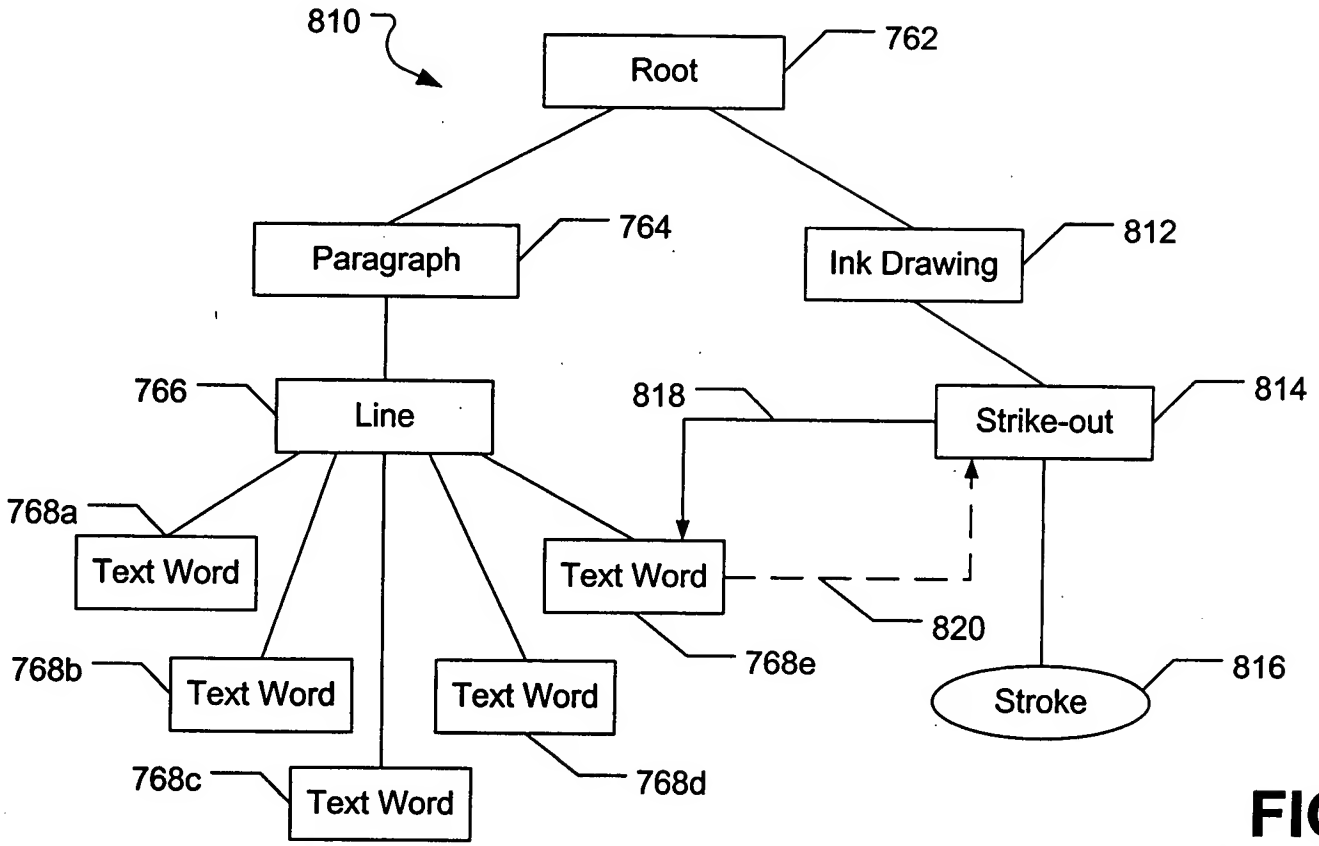

810
Root
762
Paragraph
764
Ink Drawing
812
766
Line
818
Strike-out
814
768a
Text Word
Text Word
820
768e
768b
Text Word
Text Word
816
Stroke
768c
Text Word
768d

FIG. 8B

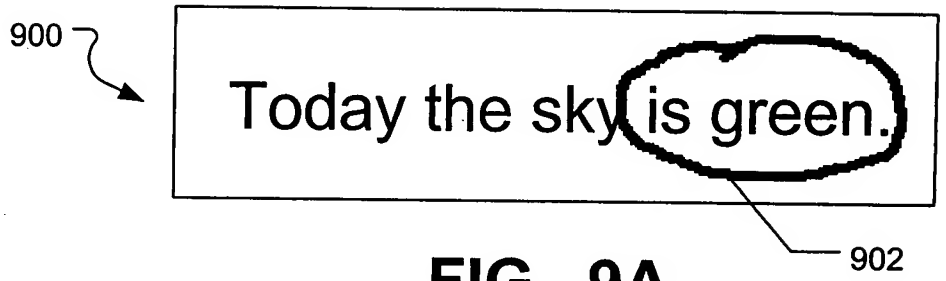

900
Today the sky is green.
902

FIG. 9A

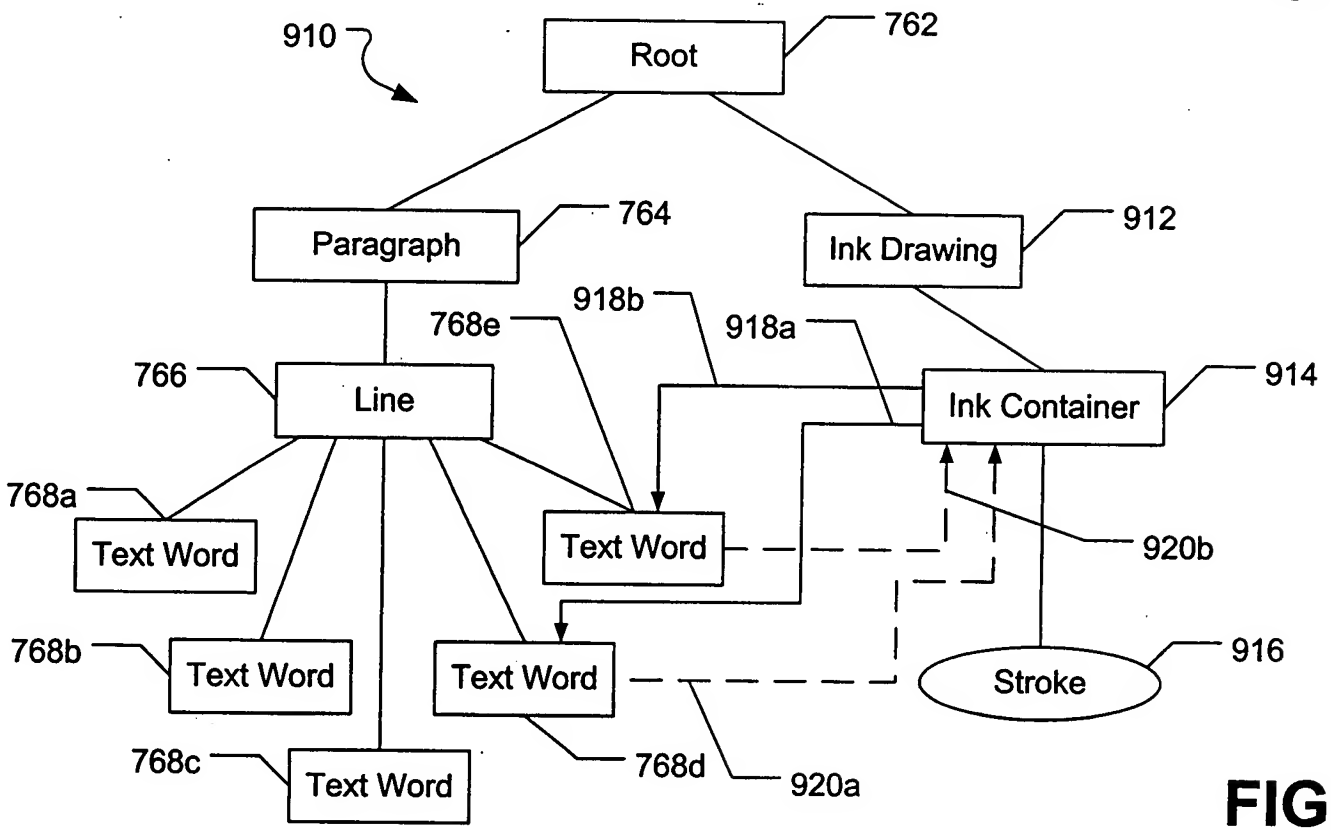

910
Root
762
Paragraph
764
Ink Drawing
912
768e
918b
918a
766
Line
Ink Container
914
768a
Text Word
Text Word
920b
768b
Text Word
Text Word
Stroke
916
768c
Text Word
768d
920a

FIG. 9B

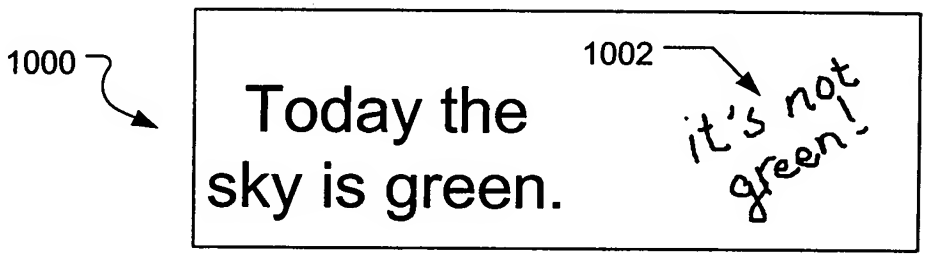
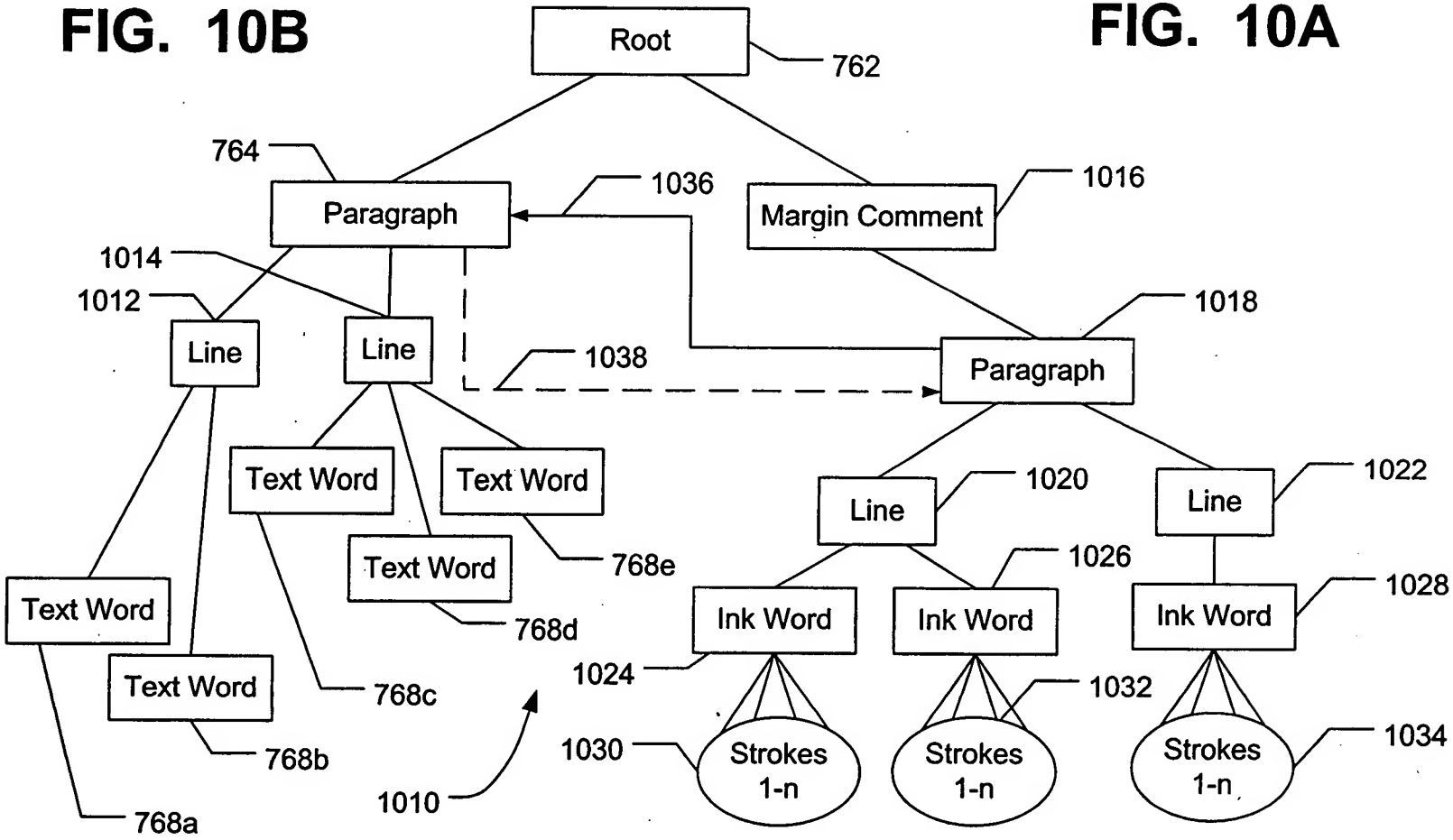


FIG. 10A

FIG. 10B



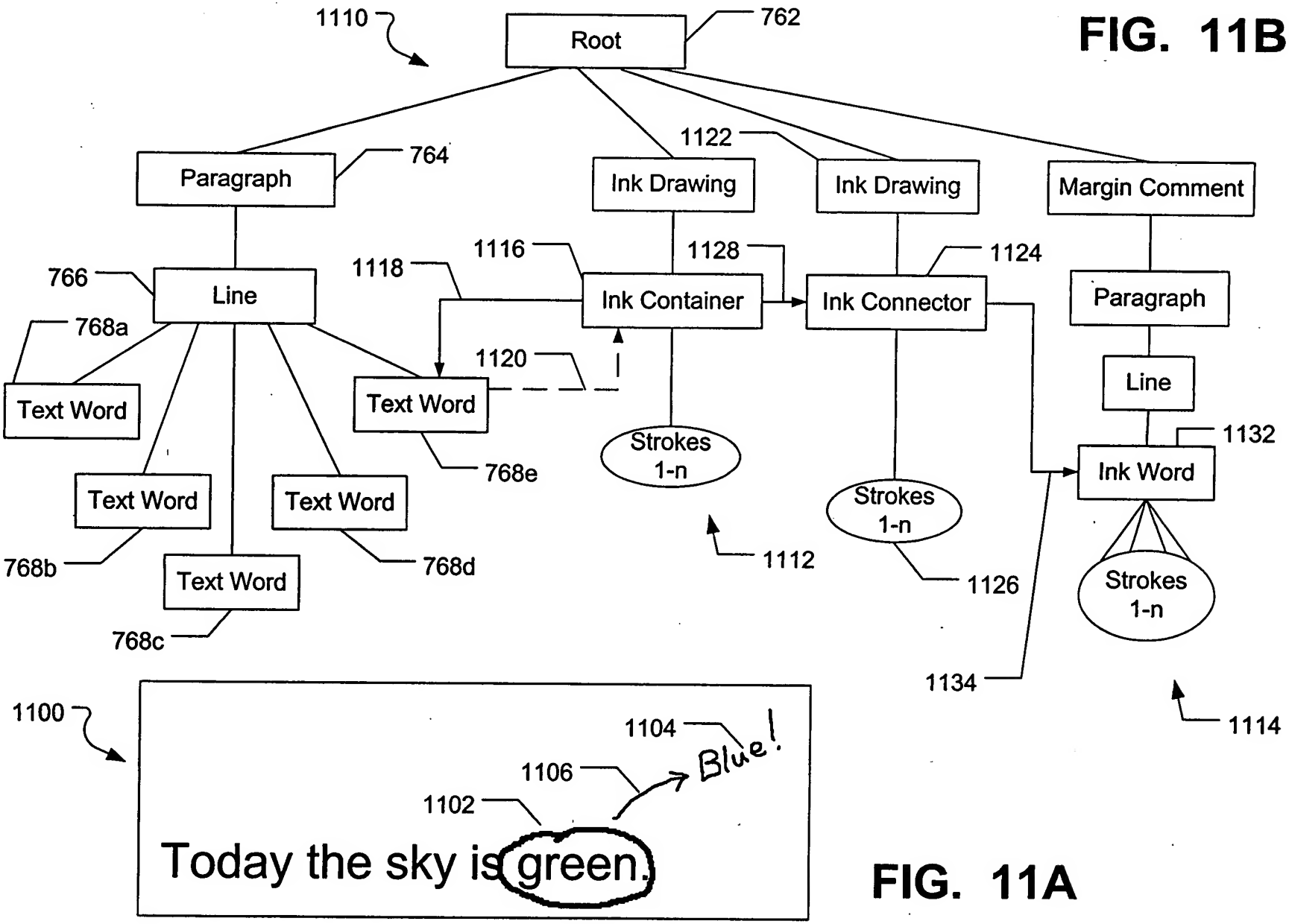


FIG. 11B

FIG. 11A

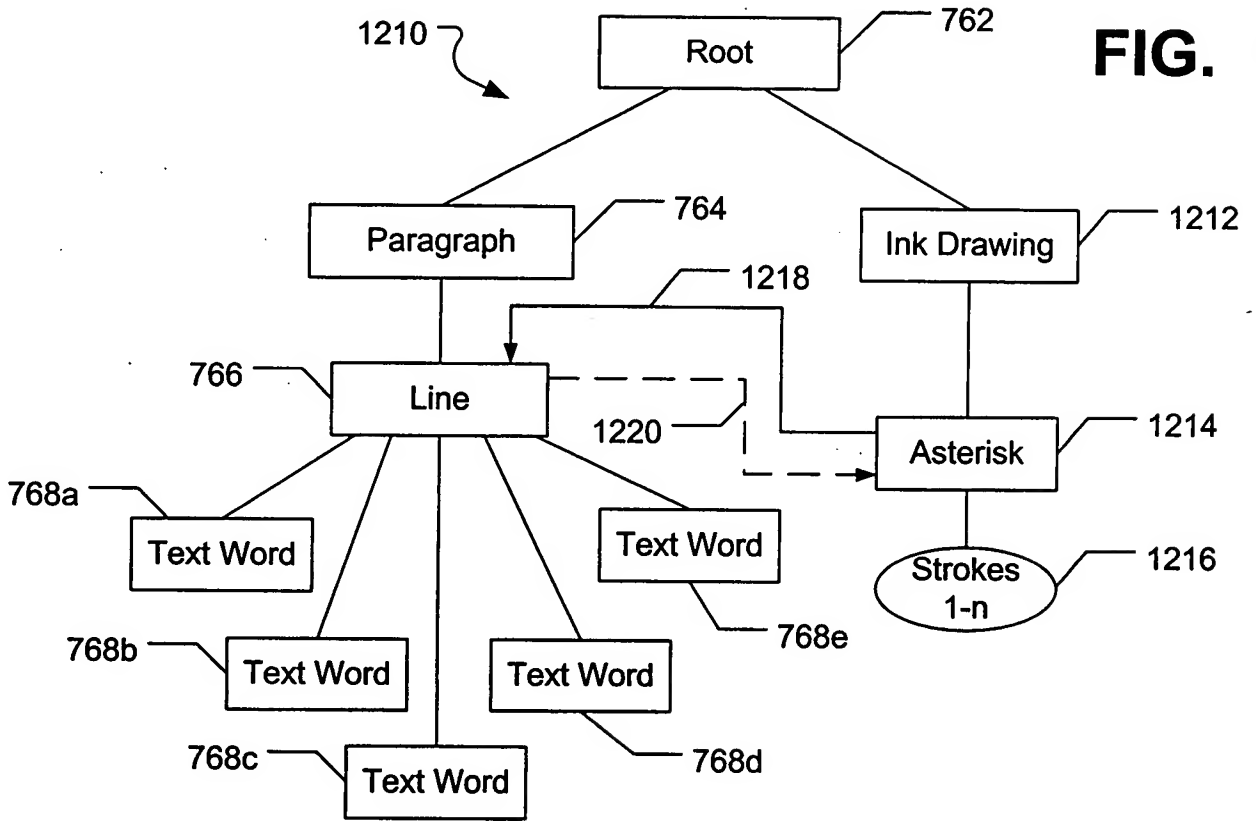


FIG. 12B

FIG. 12A

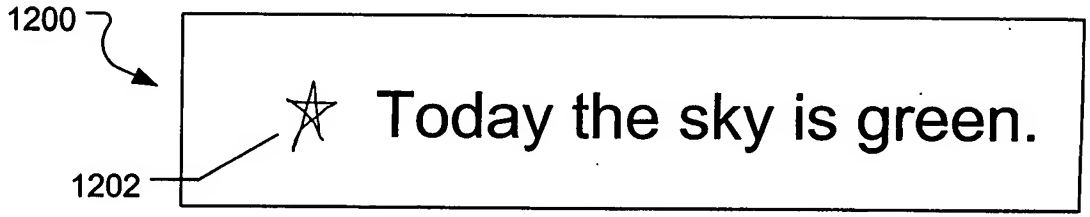


FIG. 13A

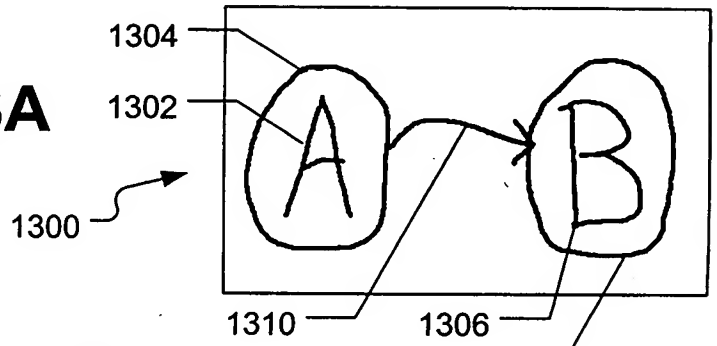


FIG. 13B

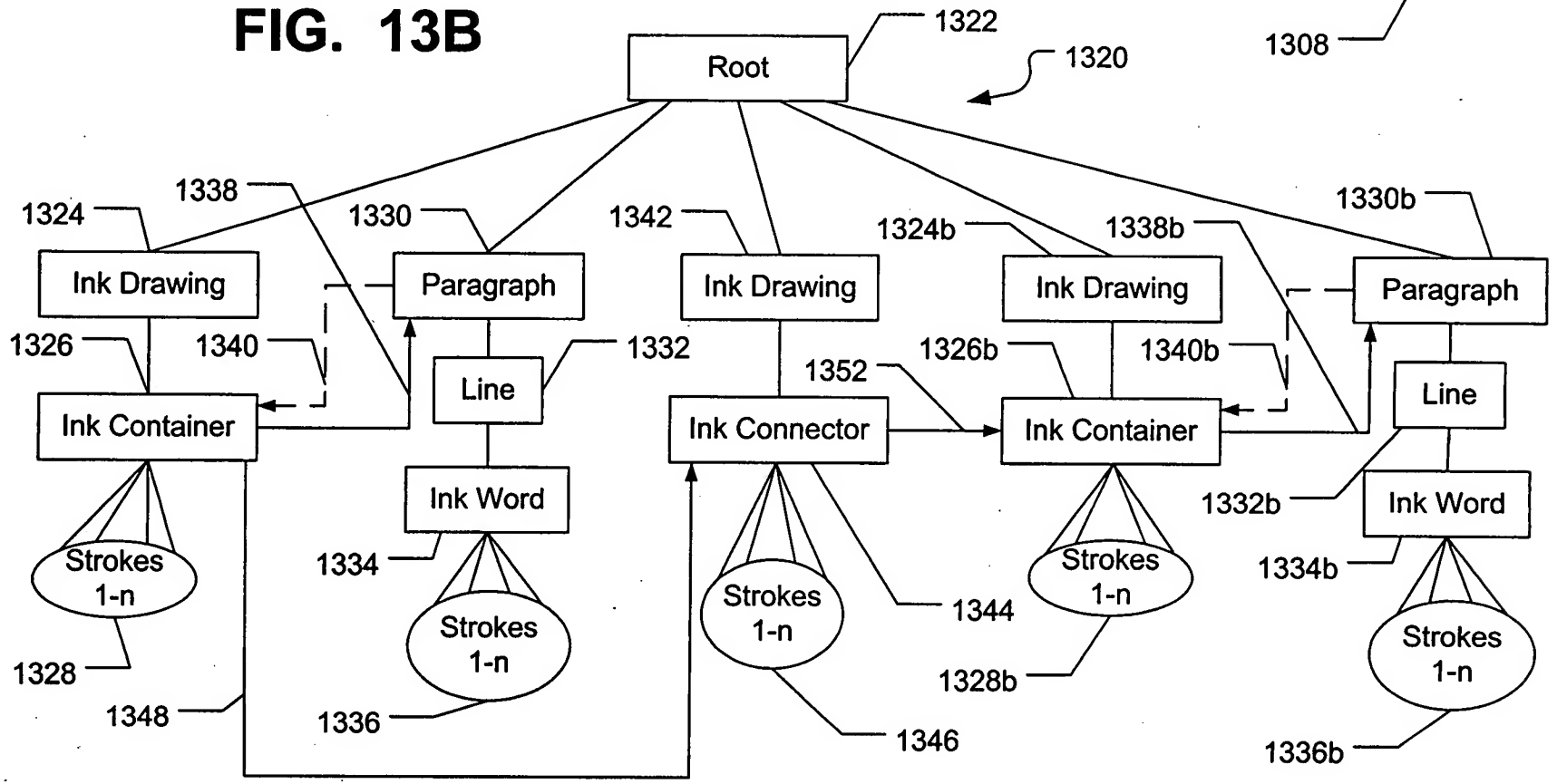


FIG. 14A

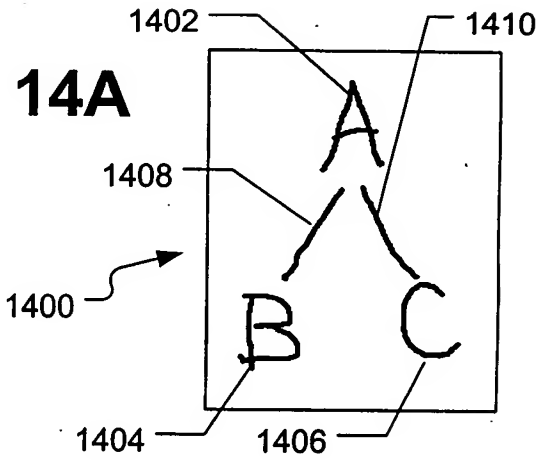
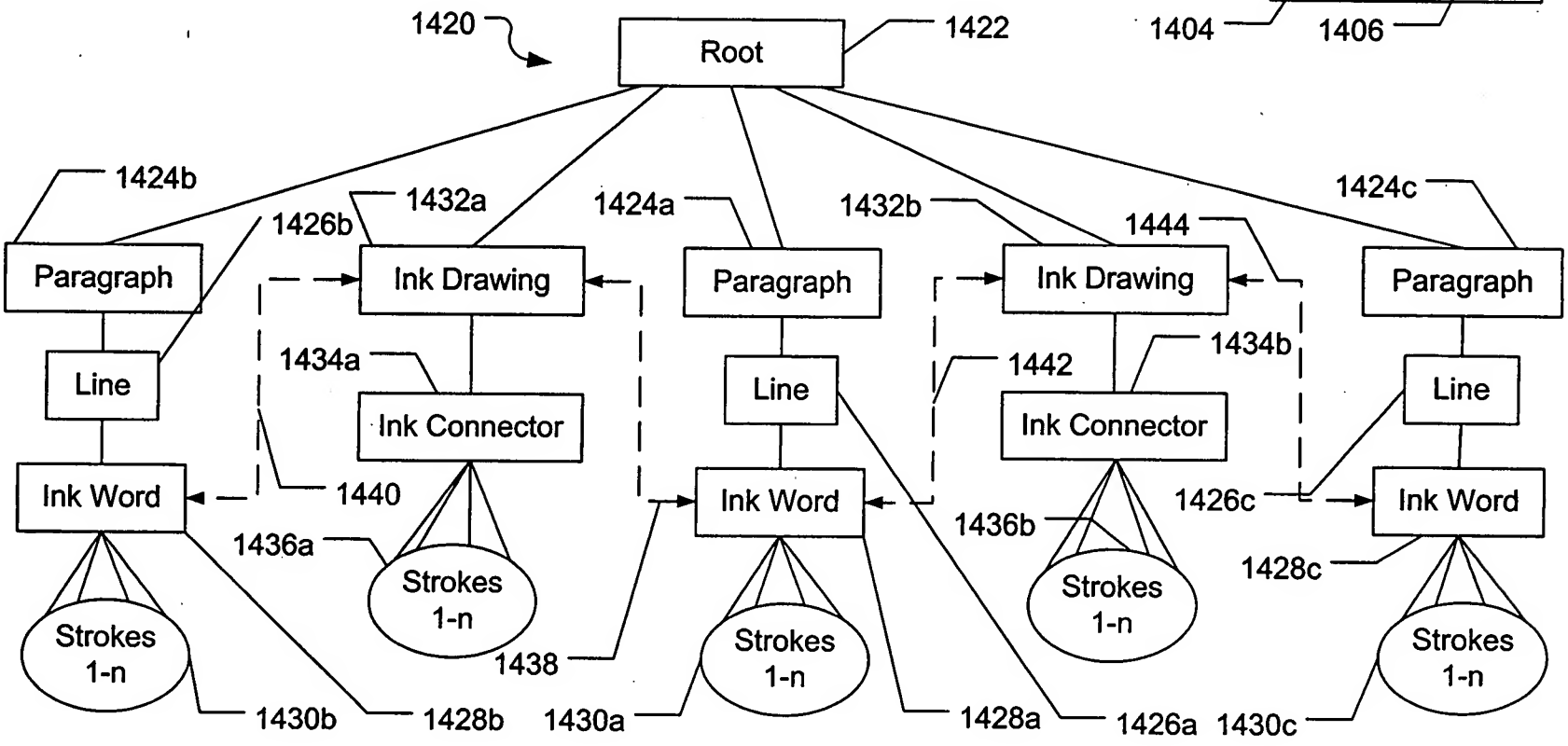


FIG. 14B



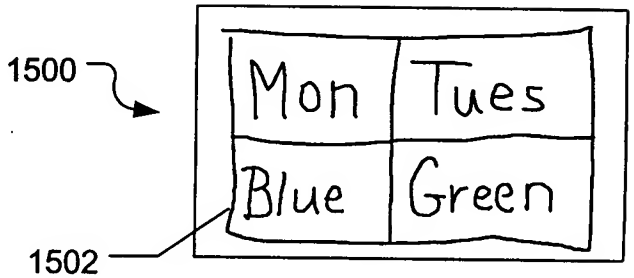
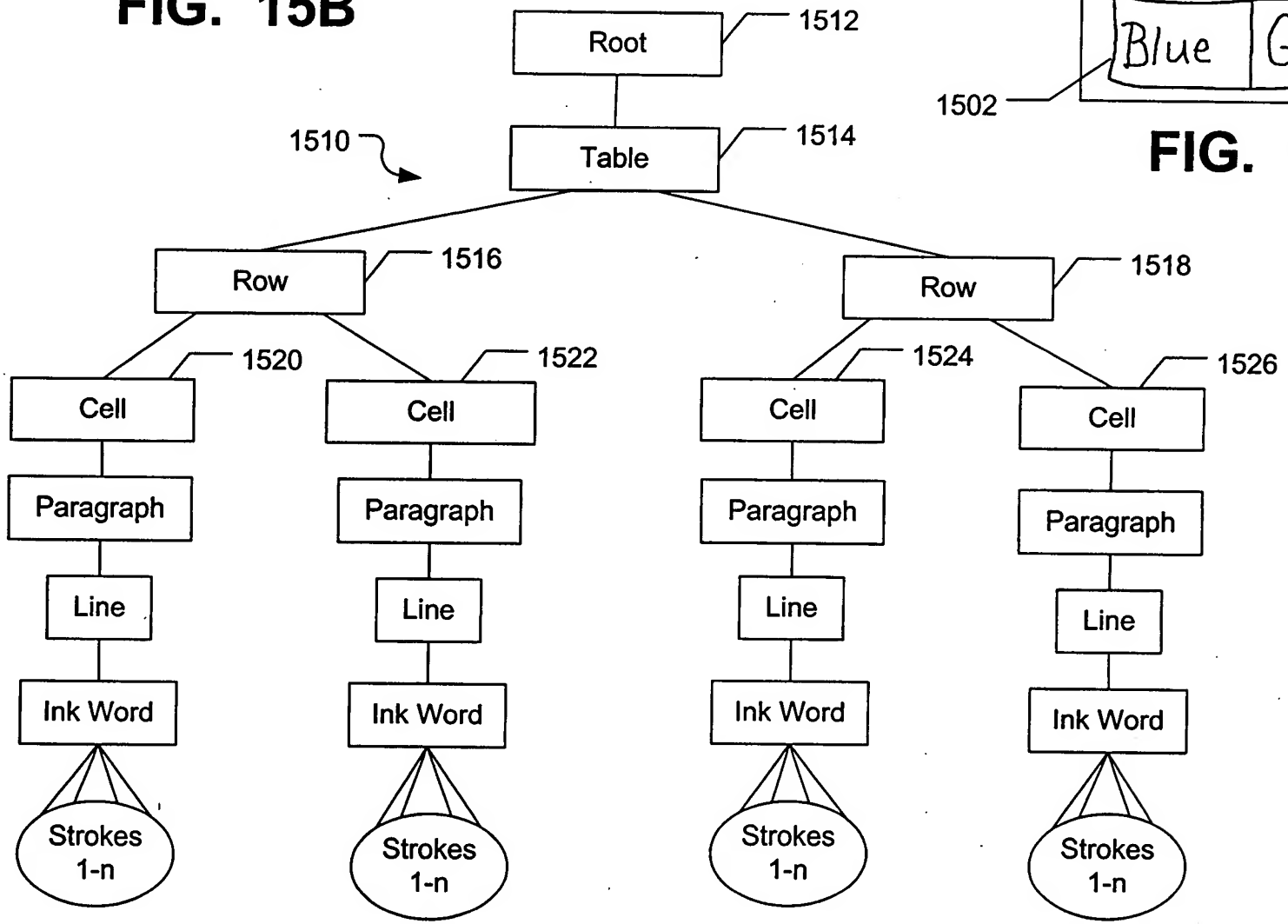


FIG. 15A

FIG. 15B



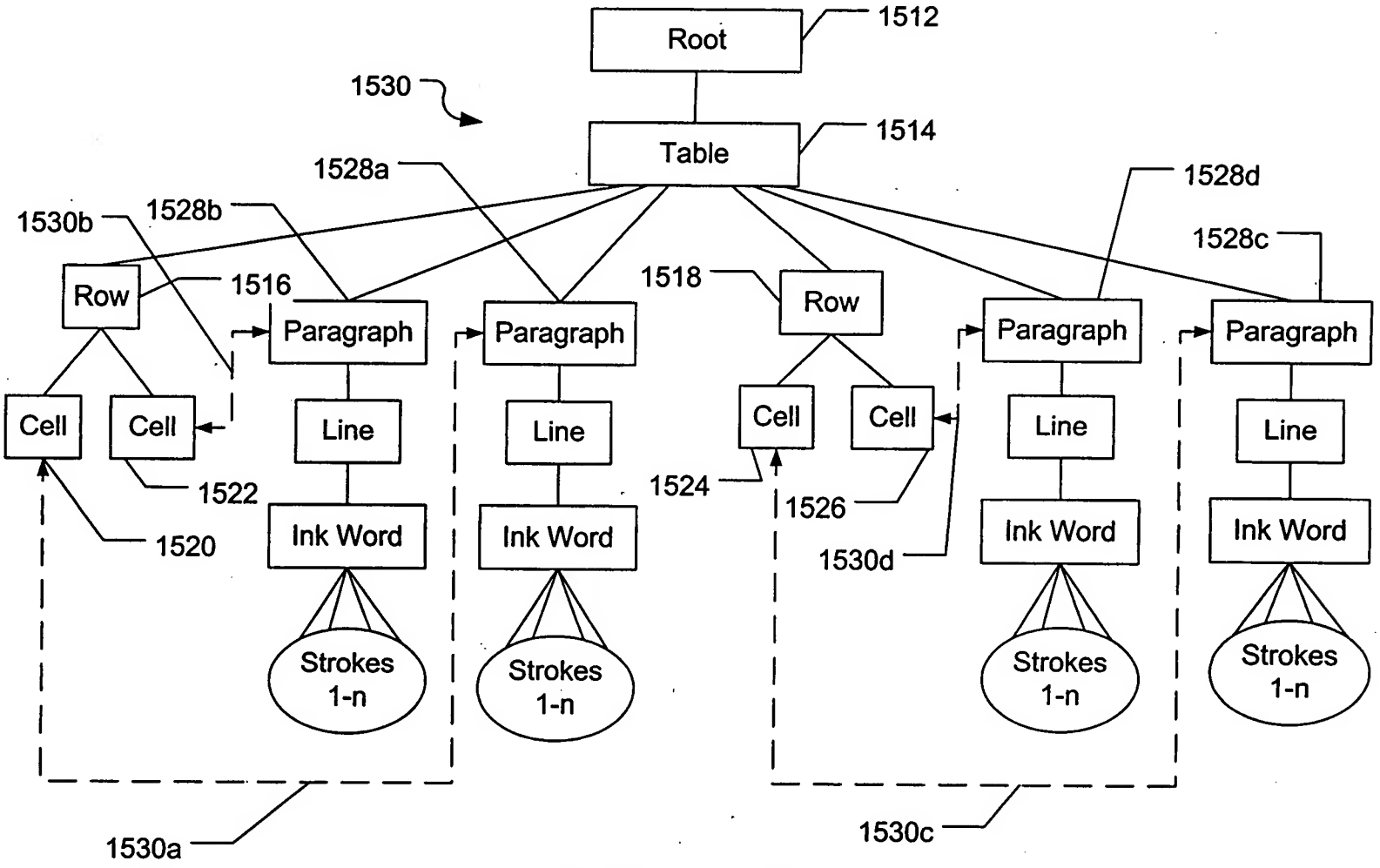

Root
1512
1530
Table
1514
1528a
1528d
1530b
1528b
1528c
Row
1516
1518
Row
Paragraph
Paragraph
Paragraph
Paragraph
Cell
Cell
Line
Line
Cell
Cell
Line
Line
1522
1524
1526
1520
Ink Word
Ink Word
Ink Word
Ink Word
1530d
Strokes
1-n
Strokes
1-n
Strokes
1-n
Strokes
1-n
1530a
1530c

FIG. 15C

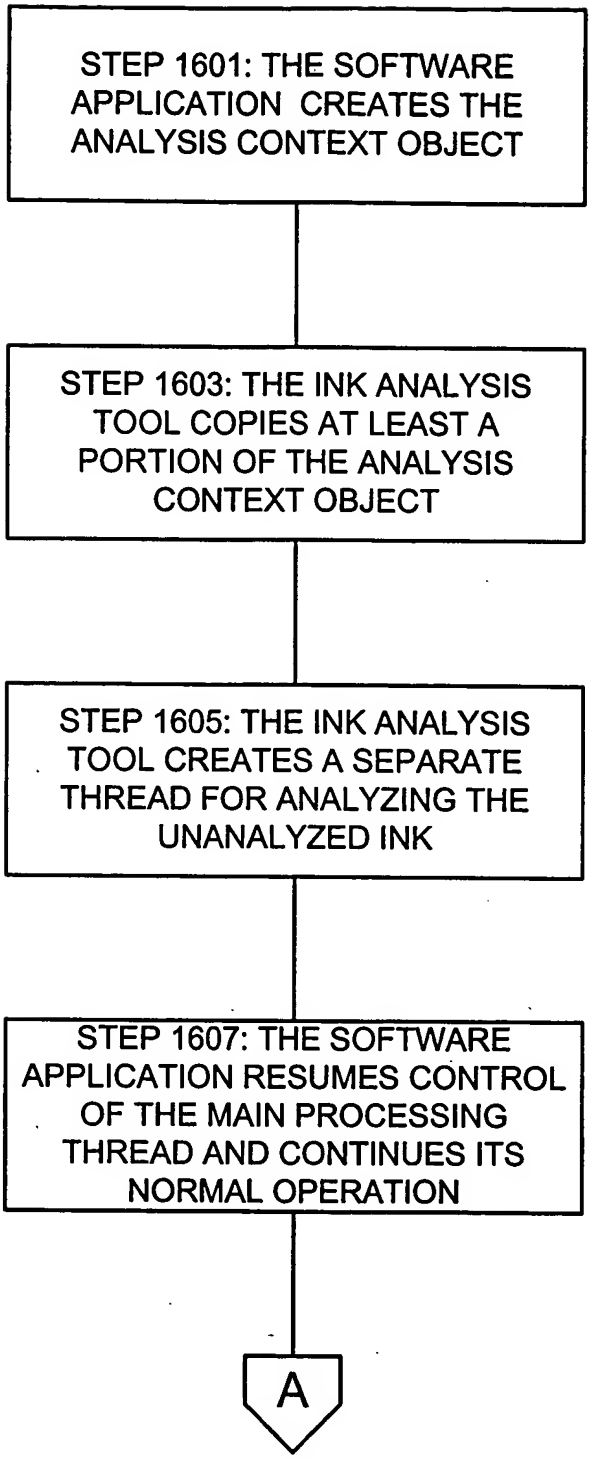

STEP 1601: THE SOFTWARE APPLICATION CREATES THE ANALYSIS CONTEXT OBJECT
STEP 1603: THE INK ANALYSIS TOOL COPIES AT LEAST A PORTION OF THE ANALYSIS CONTEXT OBJECT
STEP 1605: THE INK ANALYSIS TOOL CREATES A SEPARATE THREAD FOR ANALYZING THE UNANALYZED INK
STEP 1607: THE SOFTWARE APPLICATION RESUMES CONTROL OF THE MAIN PROCESSING THREAD AND CONTINUES ITS NORMAL OPERATION
A

FIG. 16A

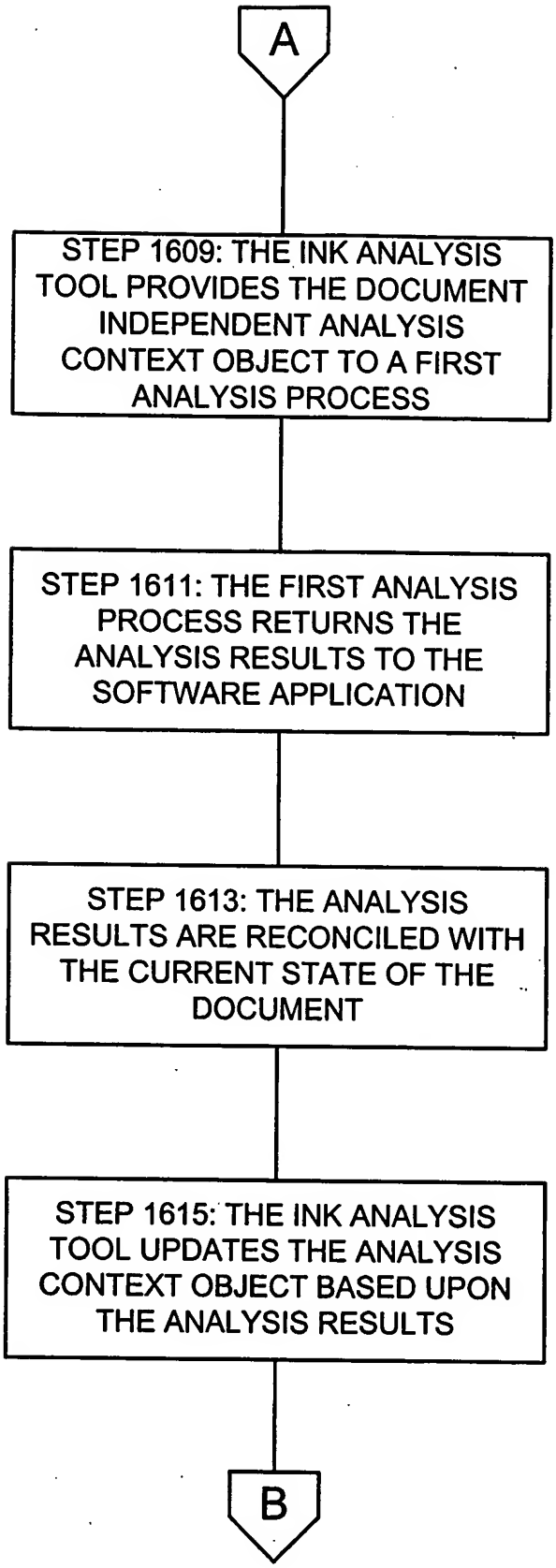

A
STEP 1609: THE INK ANALYSIS TOOL PROVIDES THE DOCUMENT INDEPENDENT ANALYSIS CONTEXT OBJECT TO A FIRST ANALYSIS PROCESS
STEP 1611: THE FIRST ANALYSIS PROCESS RETURNS THE ANALYSIS RESULTS TO THE SOFTWARE APPLICATION
STEP 1613: THE ANALYSIS RESULTS ARE RECONCILED WITH THE CURRENT STATE OF THE DOCUMENT
STEP 1615: THE INK ANALYSIS TOOL UPDATES THE ANALYSIS CONTEXT OBJECT BASED UPON THE ANALYSIS RESULTS
B

FIG. 16B

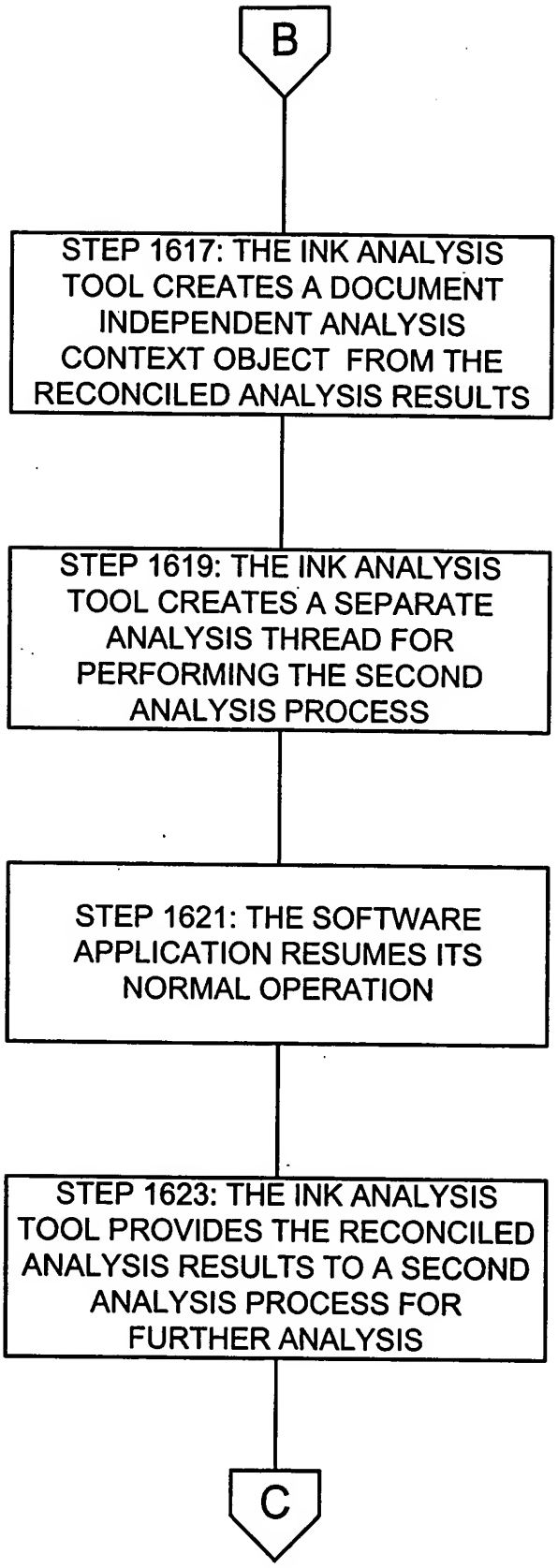

B
STEP 1617: THE INK ANALYSIS TOOL CREATES A DOCUMENT INDEPENDENT ANALYSIS CONTEXT OBJECT FROM THE RECONCILED ANALYSIS RESULTS
STEP 1619: THE INK ANALYSIS TOOL CREATES A SEPARATE ANALYSIS THREAD FOR PERFORMING THE SECOND ANALYSIS PROCESS
STEP 1621: THE SOFTWARE APPLICATION RESUMES ITS NORMAL OPERATION
STEP 1623: THE INK ANALYSIS TOOL PROVIDES THE RECONCILED ANALYSIS RESULTS TO A SECOND ANALYSIS PROCESS FOR FURTHER ANALYSIS
C

FIG. 16C

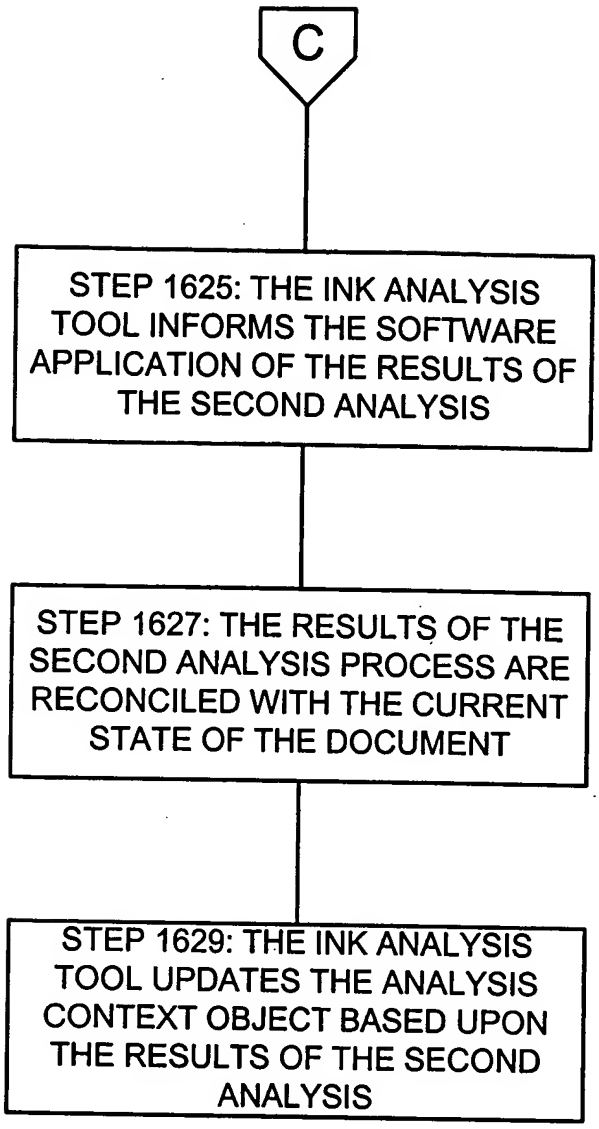

C
STEP 1625: THE INK ANALYSIS TOOL INFORMS THE SOFTWARE APPLICATION OF THE RESULTS OF THE SECOND ANALYSIS
STEP 1627: THE RESULTS OF THE SECOND ANALYSIS PROCESS ARE RECONCILED WITH THE CURRENT STATE OF THE DOCUMENT
STEP 1629: THE INK ANALYSIS TOOL UPDATES THE ANALYSIS CONTEXT OBJECT BASED UPON THE RESULTS OF THE SECOND ANALYSIS

FIG. 16D

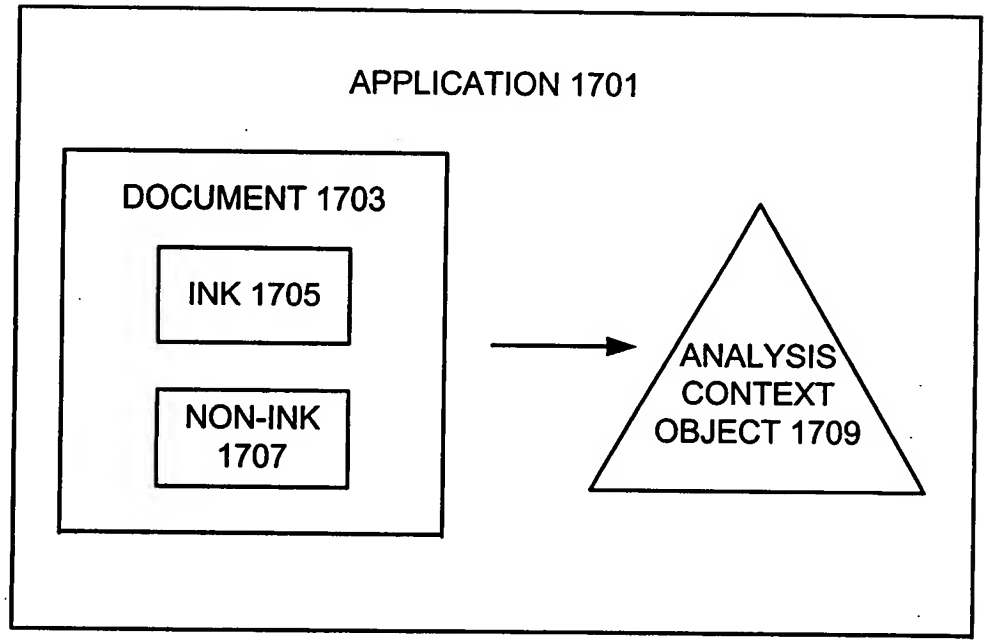

APPLICATION 1701
DOCUMENT 1703
INK 1705
NON-INK 1707
ANALYSIS CONTEXT OBJECT 1709

FIG. 17

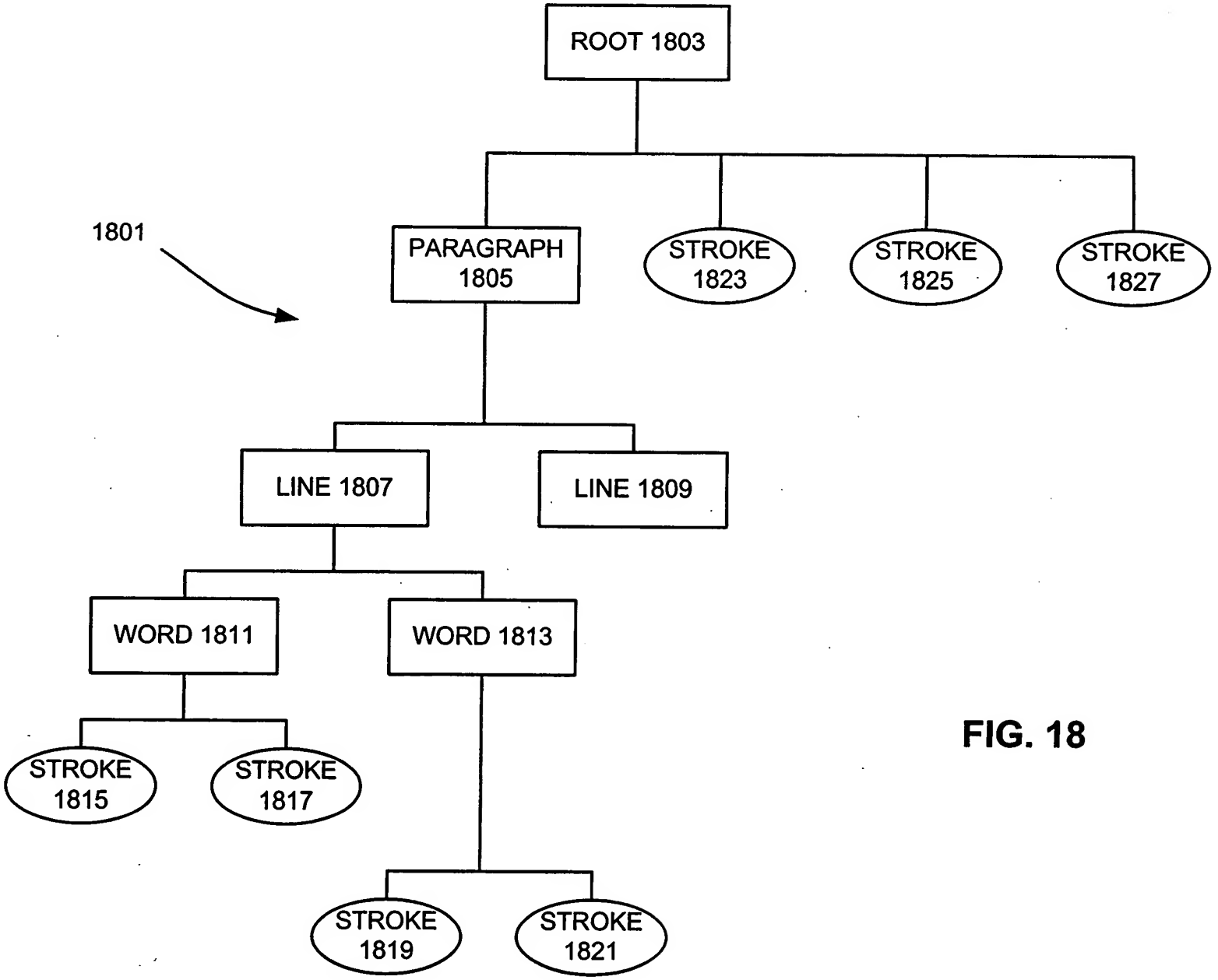

ROOT 1803
1801
PARAGRAPH 1805
STROKE 1823
STROKE 1825
STROKE 1827
LINE 1807
LINE 1809
WORD 1811
WORD 1813
STROKE 1815
STROKE 1817
STROKE 1819
STROKE 1821

FIG. 18

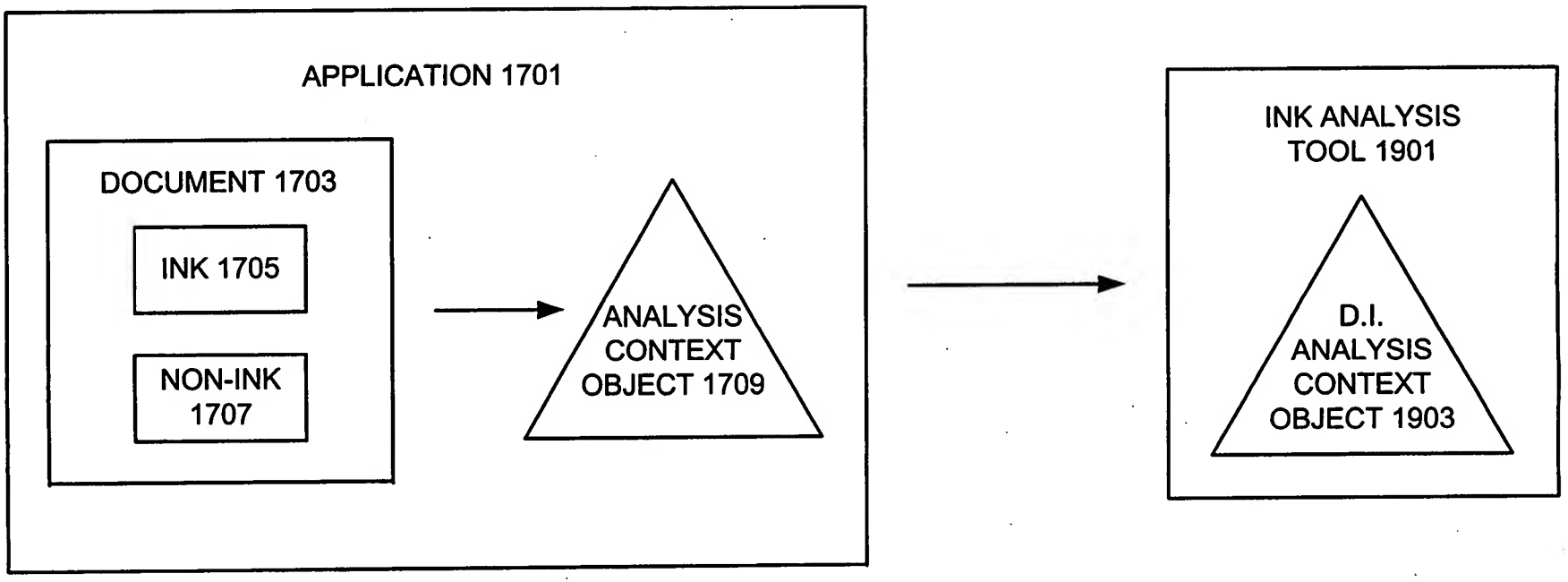

APPLICATION 1701
DOCUMENT 1703
INK 1705
NON-INK 1707
ANALYSIS CONTEXT OBJECT 1709
INK ANALYSIS TOOL 1901
D.I. ANALYSIS CONTEXT OBJECT 1903

FIG. 19

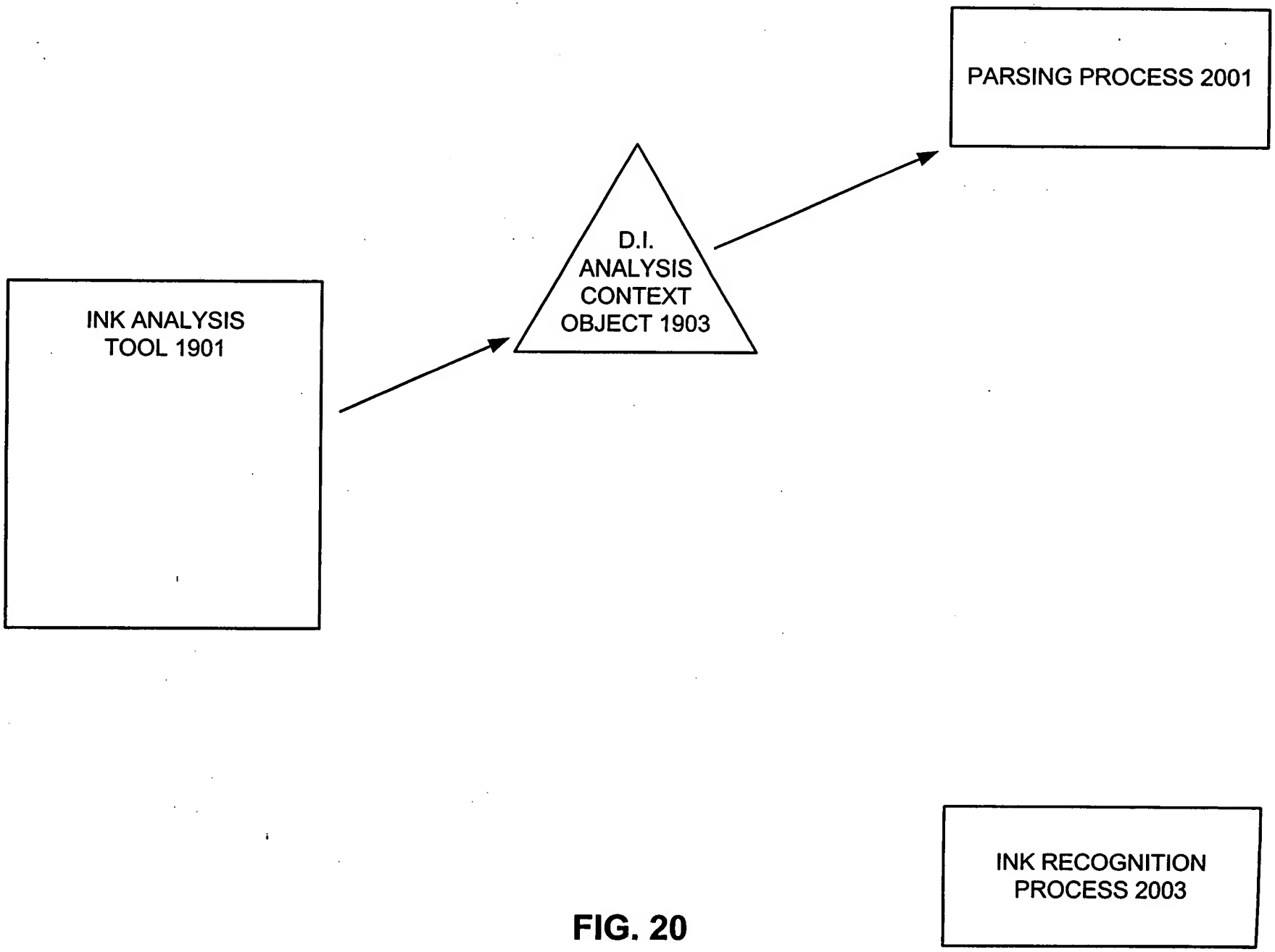

PARSING PROCESS 2001
D.I.
ANALYSIS
CONTEXT
OBJECT 1903
INK ANALYSIS
TOOL 1901
INK RECOGNITION
PROCESS 2003

FIG. 20

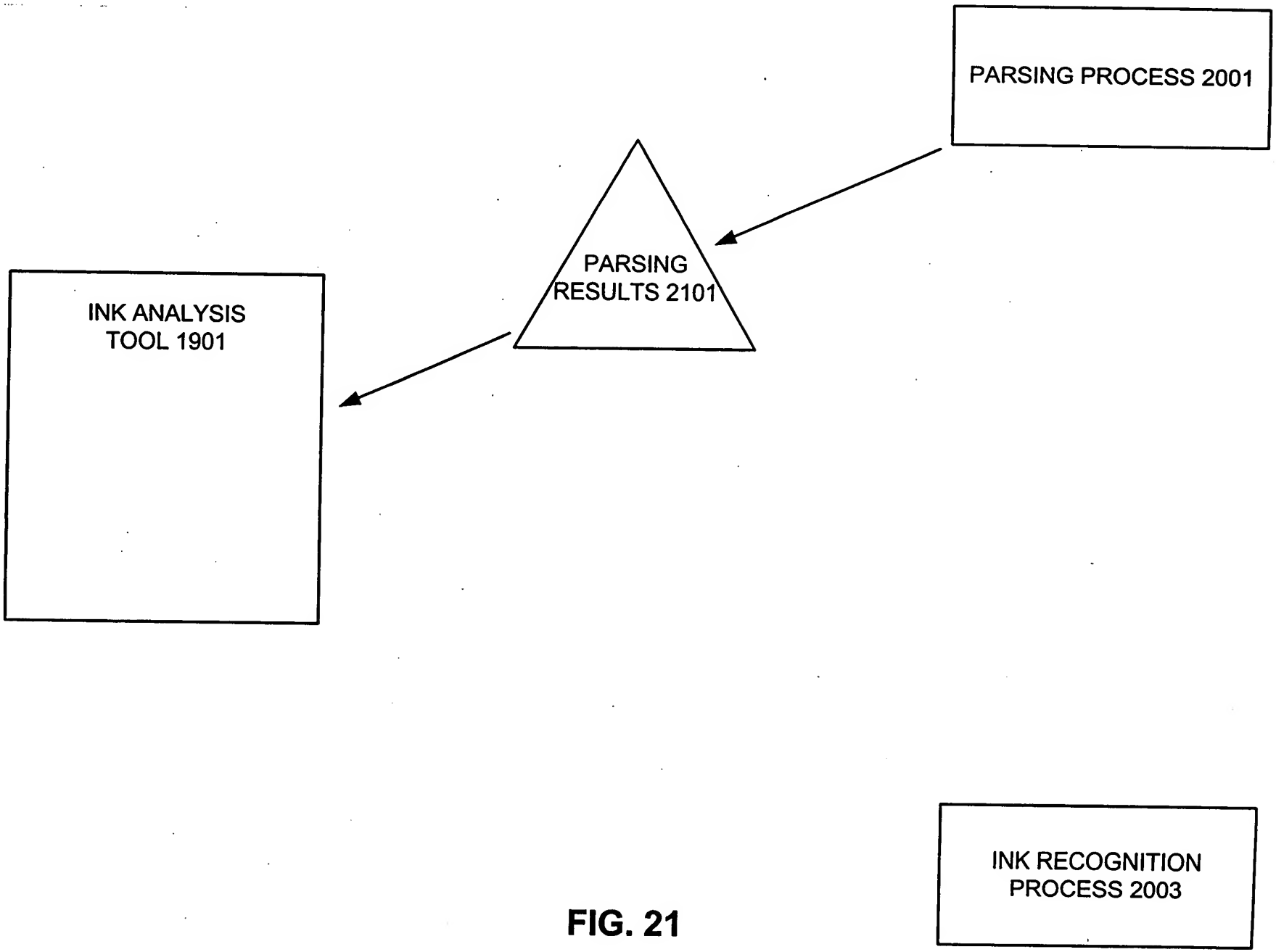
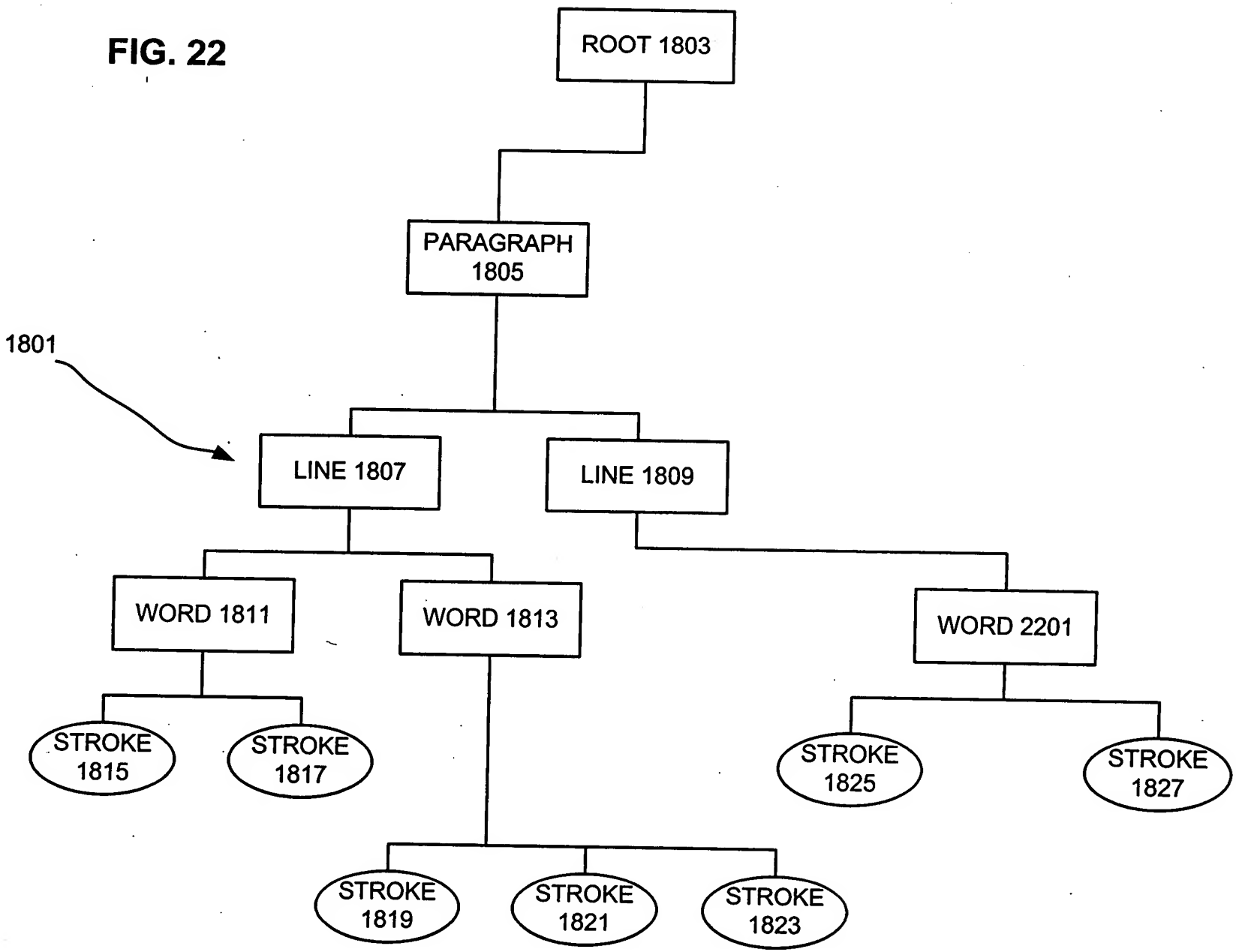

PARSING PROCESS 2001
PARSING RESULTS 2101
INK ANALYSIS TOOL 1901
INK RECOGNITION PROCESS 2003

FIG. 21

FIG. 22


ROOT 1803
PARAGRAPH 1805
1801
LINE 1807
LINE 1809
WORD 1811
WORD 1813
WORD 2201
STROKE 1815
STROKE 1817
STROKE 1819
STROKE 1821
STROKE 1823
STROKE 1825
STROKE 1827

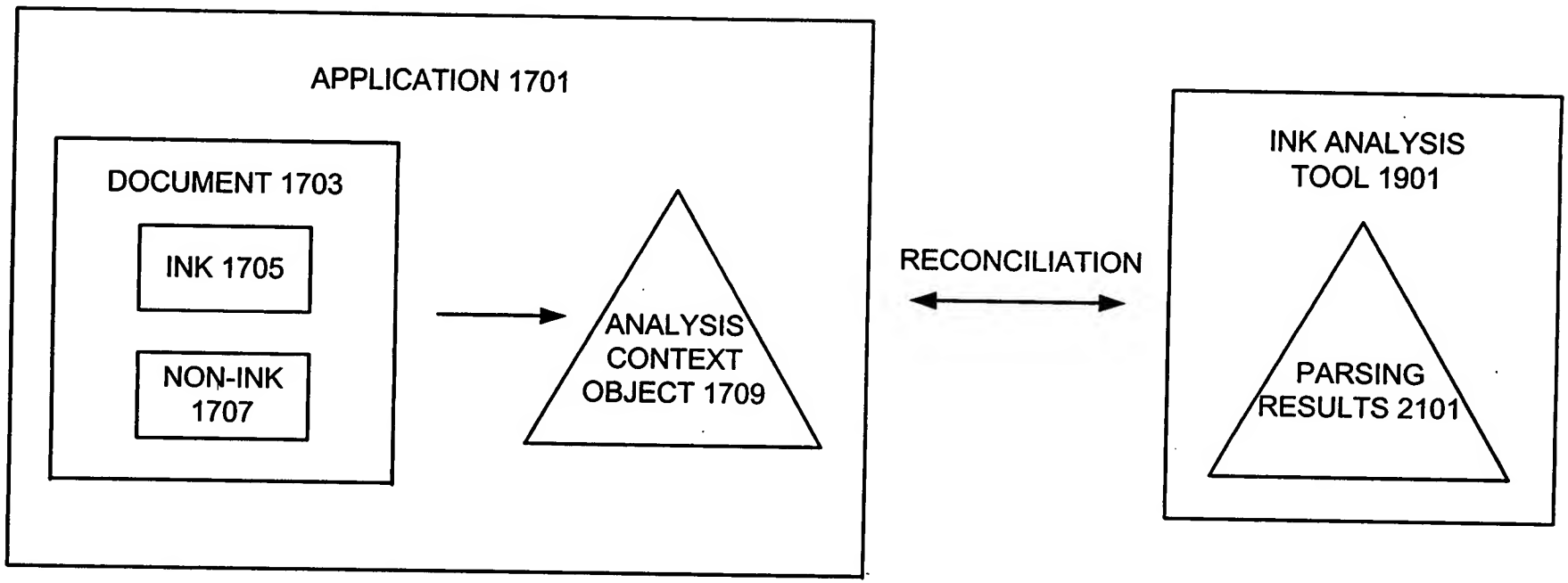

APPLICATION 1701
DOCUMENT 1703
INK 1705
NON-INK 1707
ANALYSIS CONTEXT OBJECT 1709
RECONCILIATION
INK ANALYSIS TOOL 1901
PARSING RESULTS 2101

FIG. 23

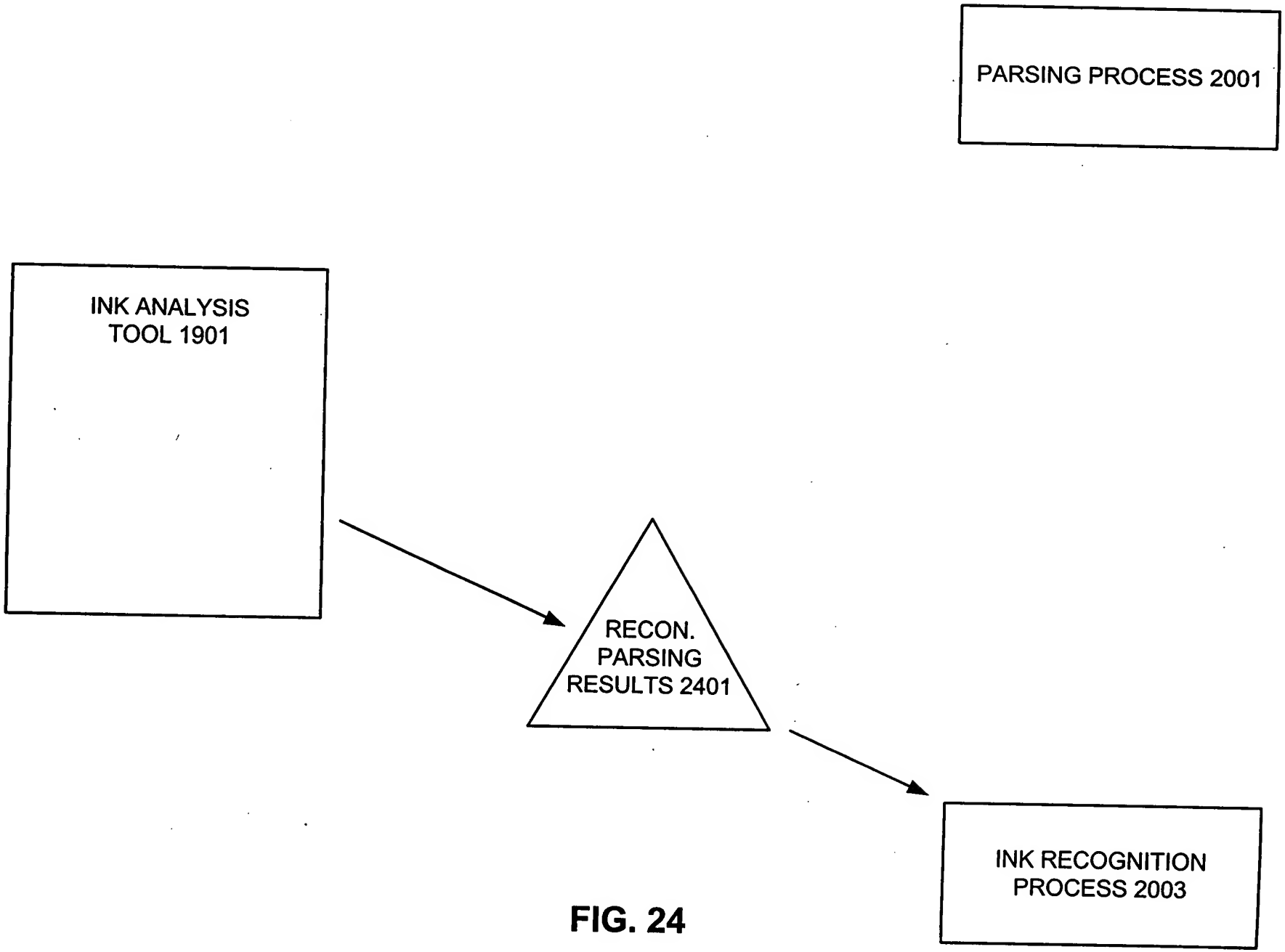

PARSING PROCESS 2001
INK ANALYSIS TOOL 1901
RECON. PARSING RESULTS 2401
INK RECOGNITION PROCESS 2003

FIG. 24

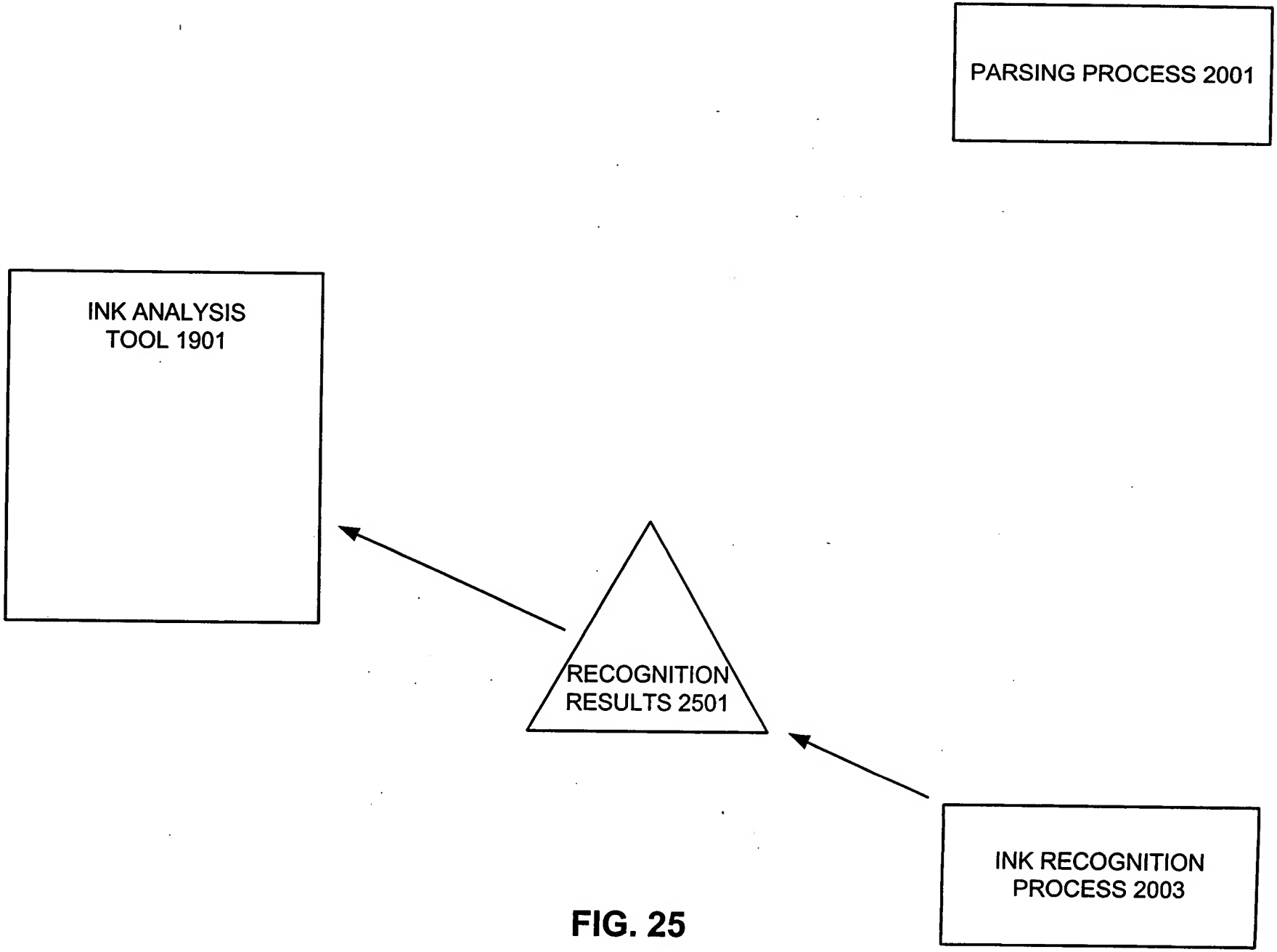

PARSING PROCESS 2001
INK ANALYSIS TOOL 1901
RECOGNITION RESULTS 2501
INK RECOGNITION PROCESS 2003

FIG. 25

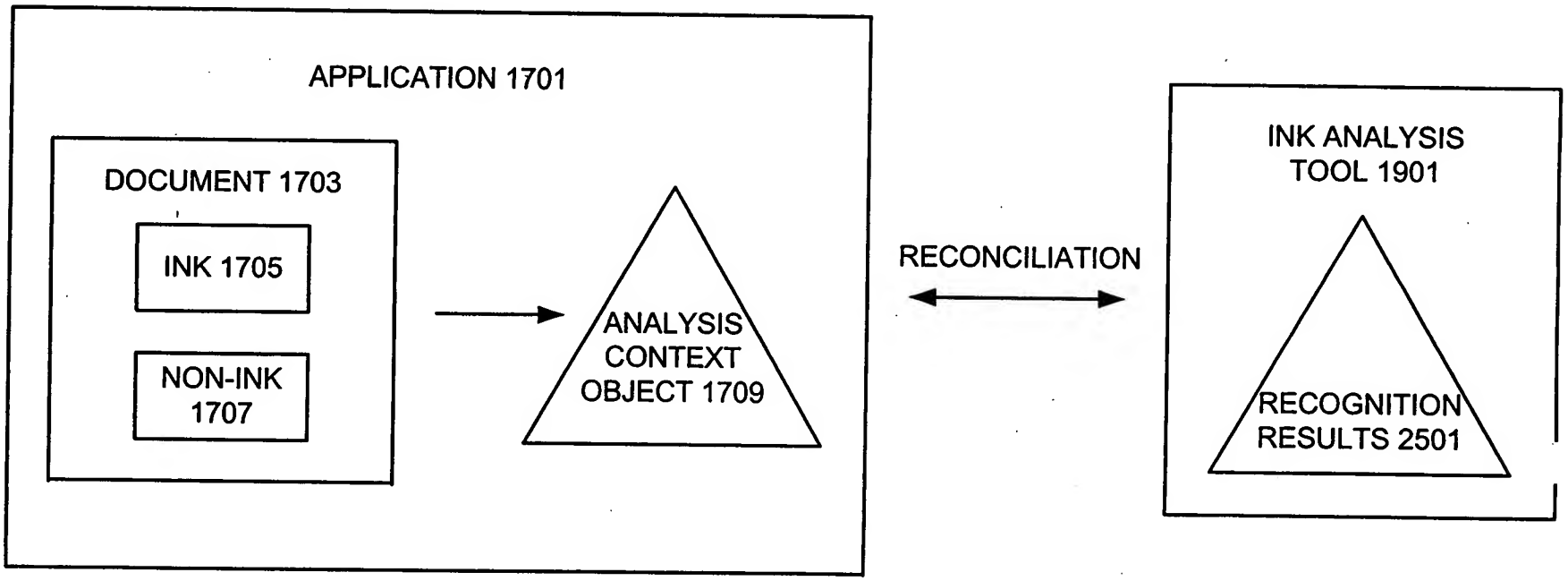

APPLICATION 1701
DOCUMENT 1703
INK 1705
NON-INK 1707
ANALYSIS CONTEXT OBJECT 1709
RECONCILIATION
INK ANALYSIS TOOL 1901
RECOGNITION RESULTS 2501

FIG. 26

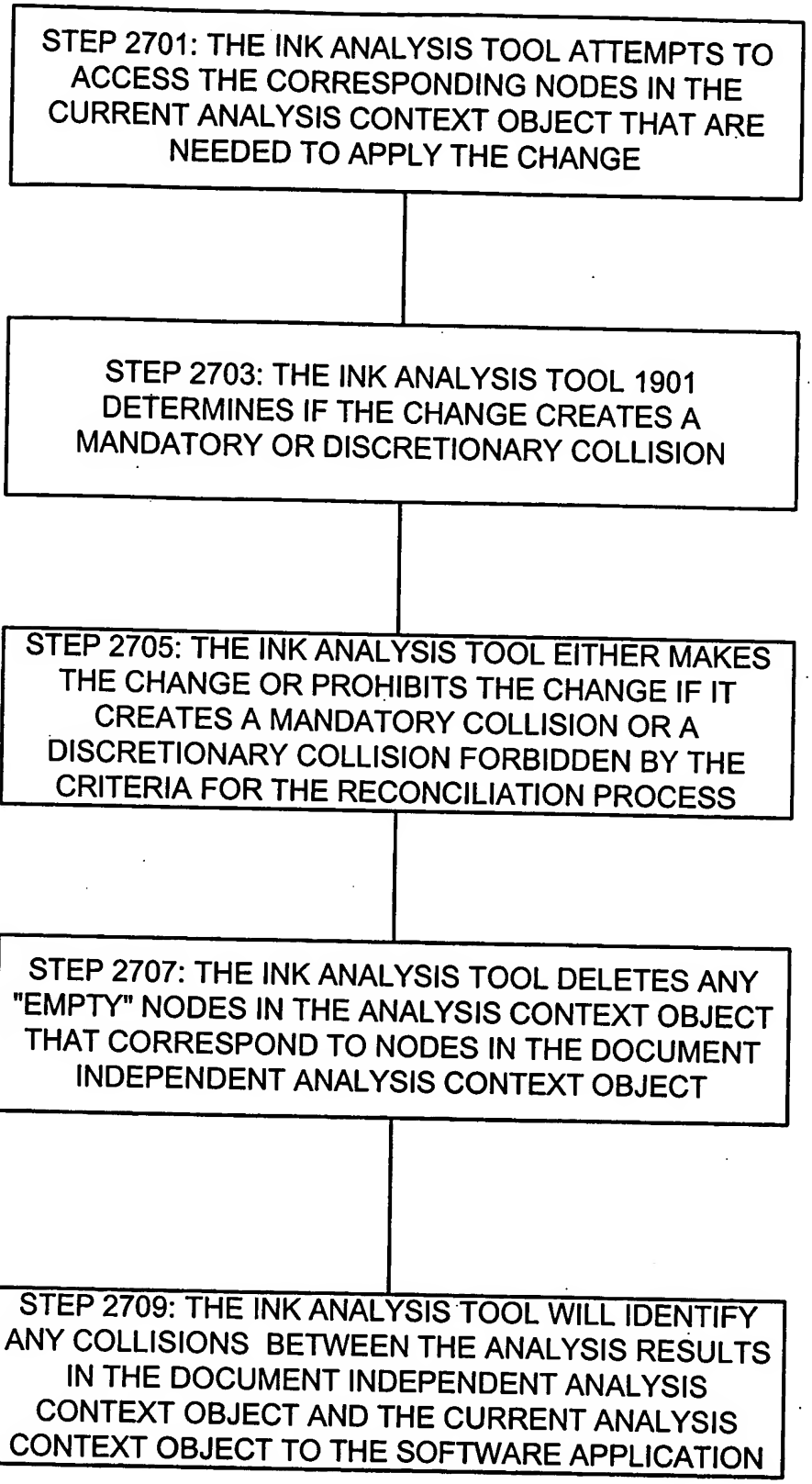

STEP 2701: THE INK ANALYSIS TOOL ATTEMPTS TO ACCESS THE CORRESPONDING NODES IN THE CURRENT ANALYSIS CONTEXT OBJECT THAT ARE NEEDED TO APPLY THE CHANGE
STEP 2703: THE INK ANALYSIS TOOL 1901 DETERMINES IF THE CHANGE CREATES A MANDATORY OR DISCRETIONARY COLLISION
STEP 2705: THE INK ANALYSIS TOOL EITHER MAKES THE CHANGE OR PROHIBITS THE CHANGE IF IT CREATES A MANDATORY COLLISION OR A DISCRETIONARY COLLISION FORBIDDEN BY THE CRITERIA FOR THE RECONCILIATION PROCESS
STEP 2707: THE INK ANALYSIS TOOL DELETES ANY "EMPTY" NODES IN THE ANALYSIS CONTEXT OBJECT THAT CORRESPOND TO NODES IN THE DOCUMENT INDEPENDENT ANALYSIS CONTEXT OBJECT
STEP 2709: THE INK ANALYSIS TOOL WILL IDENTIFY ANY COLLISIONS BETWEEN THE ANALYSIS RESULTS IN THE DOCUMENT INDEPENDENT ANALYSIS CONTEXT OBJECT AND THE CURRENT ANALYSIS CONTEXT OBJECT TO THE SOFTWARE APPLICATION

FIG. 27

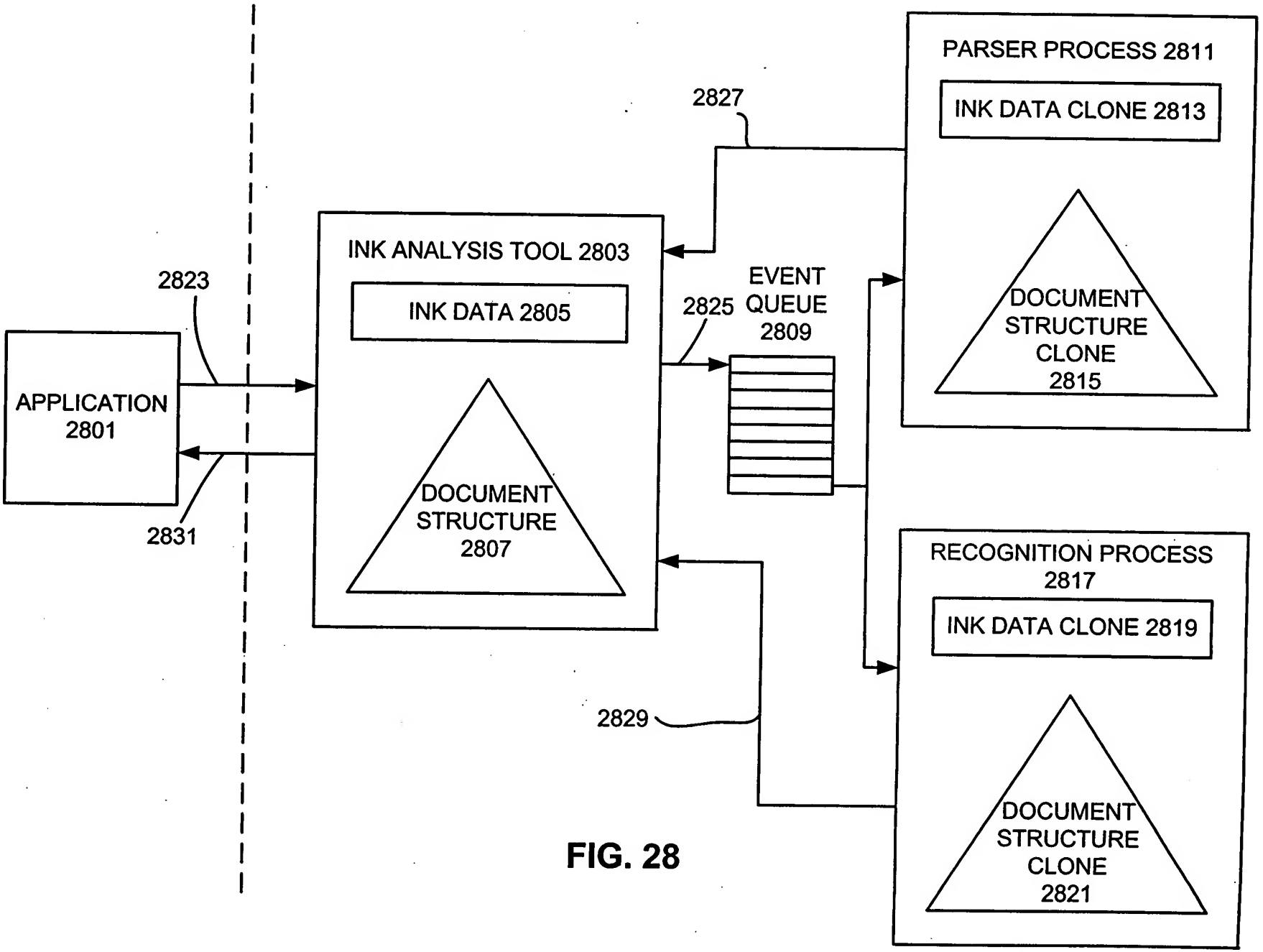

PARSER PROCESS 2811
INK DATA CLONE 2813
2827
INK ANALYSIS TOOL 2803
INK DATA 2805
2823
2825
EVENT QUEUE 2809
APPLICATION 2801
DOCUMENT STRUCTURE 2807
DOCUMENT STRUCTURE CLONE 2815
2831
RECOGNITION PROCESS 2817
INK DATA CLONE 2819
2829
DOCUMENT STRUCTURE CLONE 2821

FIG. 28